Editorial

OUR baby portable, the Handie Talkie, described in this issue, is something of a landmark in receiver design.

In itself, it is the only five-valve set of its type we have yet seen, which probably makes it a "first", at least in Australia. It is as small or smaller than all the other four-valvers so far sighted, only one of which has been of Australian manufacture. This, despite the wooden cabinet we had to use, as against a thin-walled moulded type.

The problem of fitting everything into a small space, although the solution looks simple enough, is far more difficult than laying out a big set. For this reason, we are ermitting ourselves to be proud of our design, and I think you'll agree we eally have something!

A further point we have to watch is that our original shall be capable of uplication by our readers. Chassis and parts have to be obtainable, and ade to fit together. For this reason, a hand-made job using special bits nd pieces might possibly have been fractionally smaller, but so little that is doubtful whether the result would amount to much.

We are convinced that sets of this type will before long be well established sellers, simply because they fill a definite requirement. The value of nything is set by how much more one will pay to get it. If you want it badly nough, you will consider the money well spent. These sets won't be cheap ecause their total components are about the same as for bigger jobs.

For these reasons, we think our design is indicative of an entirely new pe of set. It is the logical conclusion to all the portable sets of the ast, which have really been standard chassis and speakers squeezed into abinets which were really "in betweens." So much so that one manufacturer arly in the piece actually supplied his portable with a large accumulator run it!

Where torch-type batteries are easy to get, and cheap, replacements of he A battery isn't really a problem, any more than it is with a torch. arrying it round is much the same as in the case of a camera, with little ifference in size and weight.

Good luck to the personal portables. We think ours is good enough set the pace. You'll think so too, when you first switch it on!

At last we have been able to set a publication date for our new Short-Vave Handbook, and you can look for it about the middle of October. It as grown considerably since we first thought of bringing out a call-sign st. It now covers, in addition, illustrated designs for dual-wavers, short-avers, transmitters and modulators for amateurs, and other information with particular application to short-wave listening. It will have about 100 pages ith a heavyweight, colored cover, and for its price, 2/-, cannot be equalled r value by any other publication, local or overseas.

Sorry it has been a little longer appearing than we had hoped, but we anted to get it right before you bought it.

Look for its blue cover soon, and then let us know what you think about . Next year's edition is already being planned n a much bigger scale, and we'd like to in-lude your ideas.

But that's a story for the future. We are rinting plenty, but anticipate a sell-out in ort order. Don't say we didn't warn you!

John Moyle

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In these days, goods of all descriptions are in abnormal demand and the radio industry is no exception.

Under these conditions, it is inevitable that there are some people who cannot be fully satisfied. Some of these people start looking for a reason other than the most obvious one—that the industry cannot immediately supply the inflated and unstable demand.

All sorts of tales come to light—some true, some with a vestige of distorted truth and others entirely false. You may have heard some of these yourself. You may have heard for instance, that Rola is exporting a large proportion of their production to newly found overseas markets.

Such is far from the truth, and we say quite definitely that Rola products are not going out of Australasia, which corner of the globe, it is our bounden duty to serve.

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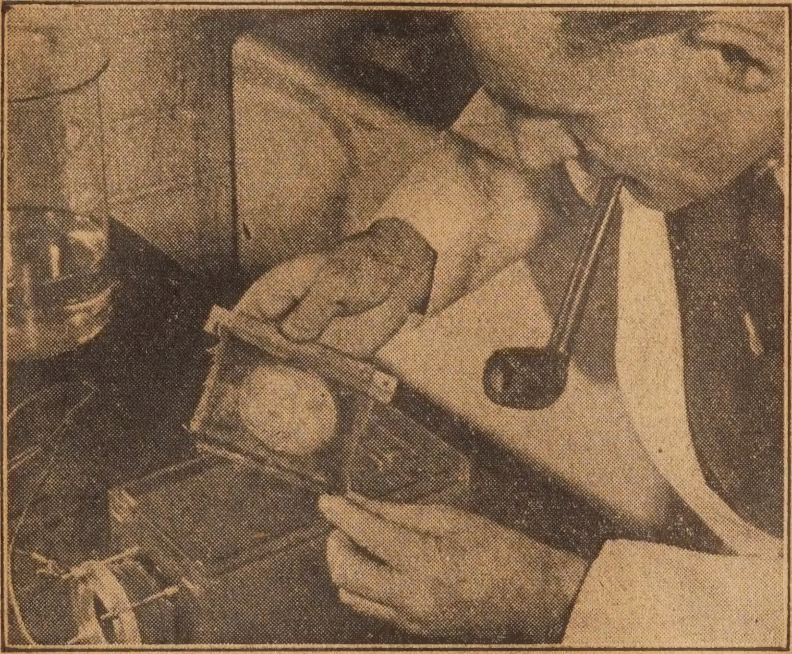
MOTHER CAN HEAR WHEN BABY CRIES

Wouldn't you like one of these? Just one more gadget from USA via which Mrs. Wayne Morris and her 3-year-old daughter say goodnight to daddy. If the baby cries in the night while in bed, she can be heard anywhere in the house. Yes, we heard—most children can get the same result with a good pair of lungs! Anyhow, it's a pretty picture.

YOUR FAMILY WASHING A PROBLEM?



Mr. John Bold, Senior Electrical Technician at the British Launderers' Research Association Laboratories, Handon, inserting a test-piece of soiled fabric into the "cleaning tank." The disc of quartz- reproducer from which the supersonic vibrations are propagated is in the circular fitting at the left-hand end of the tank. In this test transformer oil was used as the medium in the tank for certain technical reasons, but plain water is used normally.

The announcement of a promising, new method of cleaning soiled fabrics has been brought to the notice of the British Launderers' Research Association. Trade Research Associations now form an altogether characteristic feature of British industry. These organisations are staffed mainly by scientists and financed primarily by contributions from firms likely to be interested in their results; in many cases the annual income is augmented by Government grants.

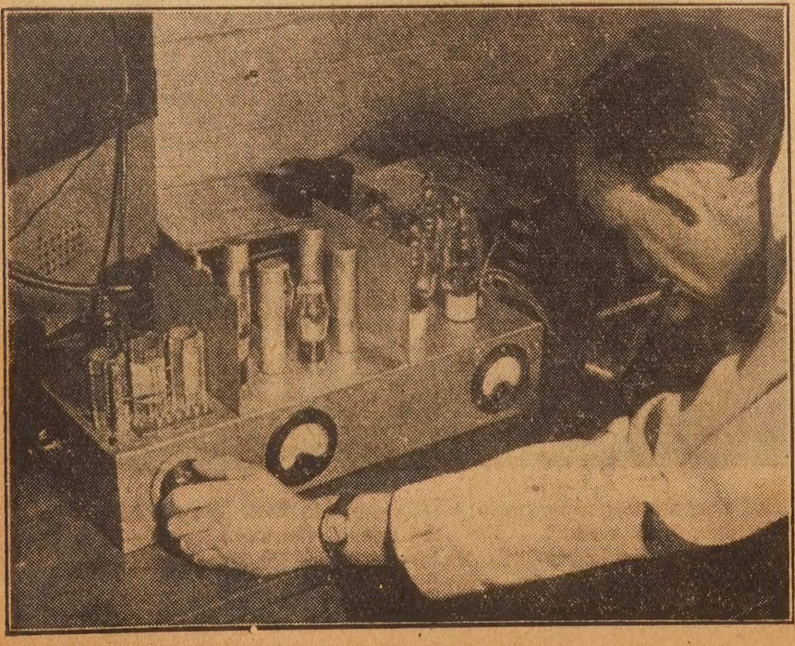
THE object of the association is t provide answers to scientific an technological problems that arise i practice in the industry concerned, an to carry out fundamental researc which ultimately is the basis for rea and lasting advances in technique.

The research director of the Launderers' Research Association is M Courtney Harwood, himself a professional research chemist, and it wa he who showed me round when visited its laboratories recently.

The laundry industry in Britain composed of many widely-scattere units, few of which, if any, are larg enough to maintain a research sta Its Research Association, therefore, the only organisation able to carry o the fundamental and ad hoc researc applicable to the industry. It al makes officers available to give advi to the people operating in the indust (as many of them do) with only a ve limited technical training. It has, besides the director, a staff of 28 scie tists, fully qualified in chemist physics, engineering and textile tec nology and bacteriology; in addition these there are 50 assistants. As w as maintaing research laboratori which at the moment are being co siderably enlarged, the association ru a small laundry so that the laborato results can immediately be put to commercial test.

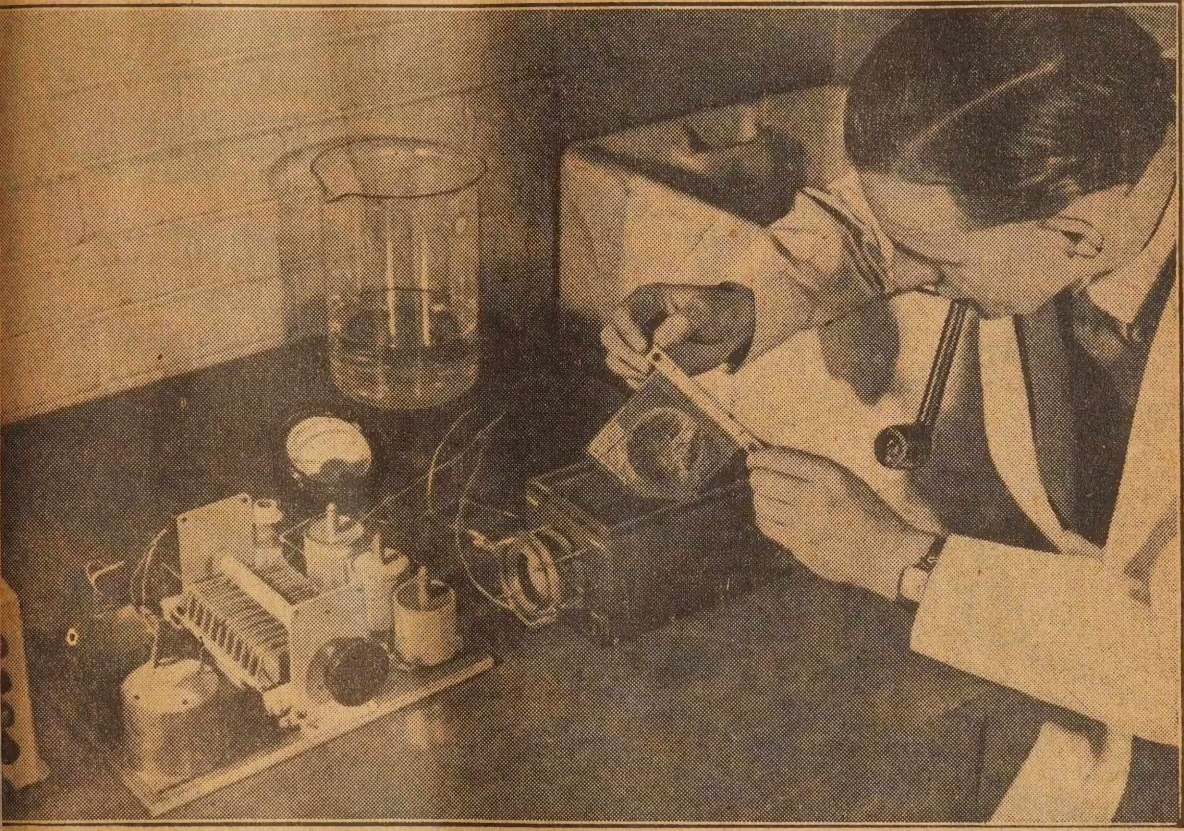
WAVES SHAKE DIRT

The news I went specifically to i vestigate was that of promising resu coming from an attempt to use supe sonic waves to shake dirt particles fabrics being laundered. The wa themselves are of the same nature sound waves, but they are far hig than the ear can hear (hence the te "supersonic"); their use follows t principle employed for submarine c tection during the war in the so-cal asdic gear. Dust particles are held fabrics by electrical attraction and is this that is broken initially by detergent solution (soaps, &c.)



Adjusting the frequency of the amplifier. Tests have been carried out up to 300 kilocycles, and tests are to be carried out at frequencies up to a megacycle.

THEN USE SUPERSONIC VIBRATIONS



Mr. Bold holding the fabric test-piece just removed from the tank after a ten-minute "treatment." The fabric which was soiled black on immersion shows clear and clean in the centre area where it was subjected to the supersonic vibrations from the quartz-reproducer.

ormal use in laundries. Supersonic aves are not intended to replace the etergents, but, after having shaken oreign particles clear of the fabric, emulsify them in the solution, and ius keep them clean.

KPERIMENTAL ONLY

Mr. Harwood stressed that, although months work has already gone to this research, and results are omising, a commercially practicle outcome is not to be expected r some long time—indeed, the paratus I saw being used was only a laboratory scale. Apart from the ctrical gear originating and amplifing the waves, the actual container s no more than about 30 cm. long d 20 cm. deep. At one end of this th was a quartz crystal cut to oscile in sympathy with the frequency d and so placed that it could pass oscillations on into the light oil h which the bath was filled. In bath stood a beaker of detergent ution in which an 8 by 8 cm. sample fabric of known "dirtiness" was pended. The electrical generating aratus is, of course, connected with quartz crystal, which transmits waves right through the bath.

he foregoing then is the scale on ch experiments are being conducted at present; a great deal more remains to be done before the new technique can be brought to a commercial scale. Even the most desirable frequency has not yet been determined; so far only those between 10 and 100 kilocycles per second have been tried at all extensively.

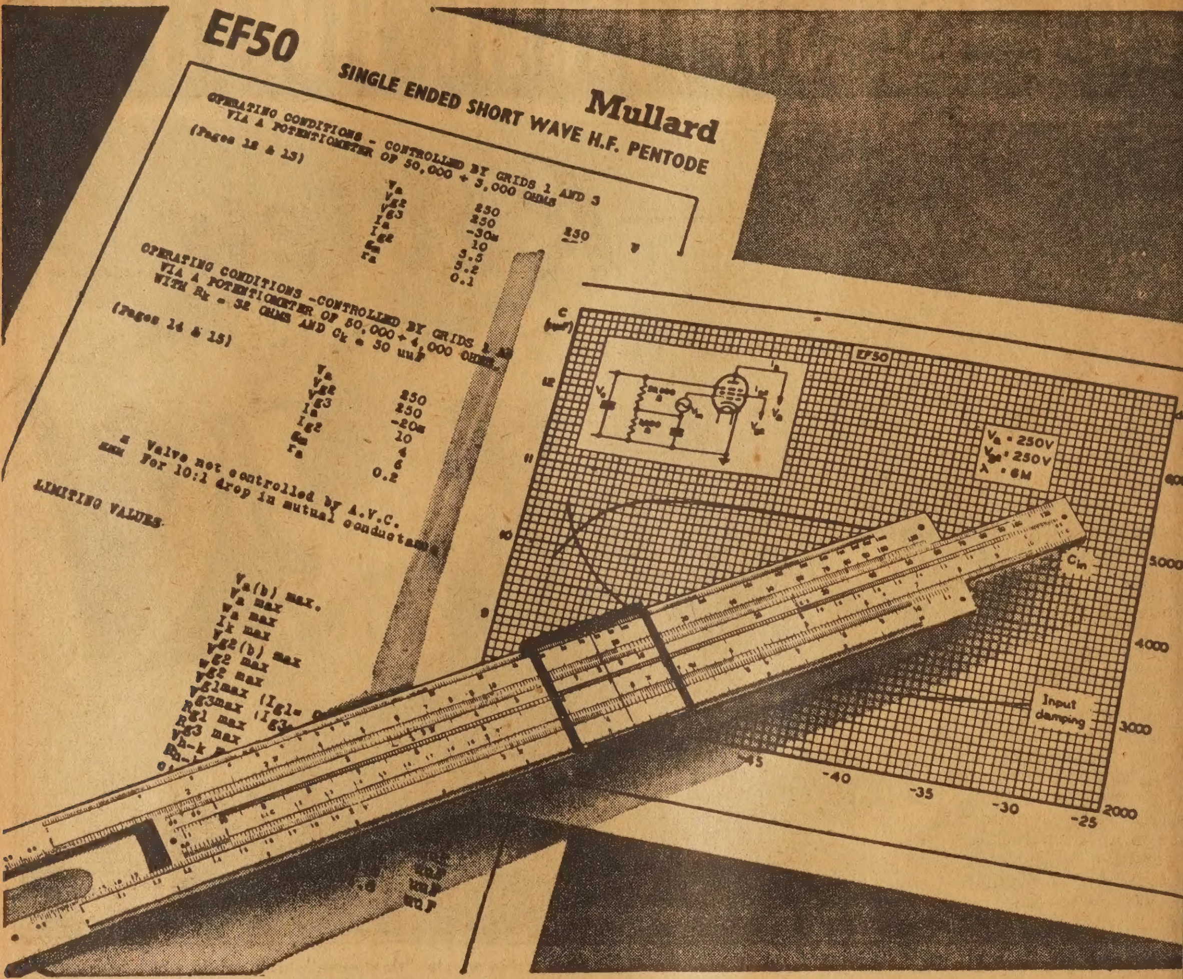
While it is too early to make predictions as to the effect such a method, if practicable, would have on the industry as a whole, it seems likely that it might enable commercial washing to be carried out at lower temperatures than are necessary with contemporary equipment. The supersonic method would certainly cut right across the normal revolving drum practice, because soiled articles would have to be extended during the process and not jumbled together as they are in the drum.

The method might also speed up handling of laundry, especially by making unnecessary preliminary sorting of articles into different classes, which at present must be carried out before any washing can begin.

by Ian Cox

NEW SOAPS

Supersonic waves, however, is only one of the subjects that are being pursued at the Launderers' Research Association. New soaps, new washing machines, and new thermostatically controlled irons are also being investigated, and, when necessary, progrates of new plant can be built in the laboratory. During the war, fundamental research was held up there, as it was in most such institutions, so that urgent ad hoc investigations might be made as required. One great advance during this period was the development of a technique for lessening cross-infection from blankets used in hospital wards. Bed making in hospitals causes bacteria from the blankets to rise into the air, thus increasing the risk of cross-infection among the patients. The Launderers' Research Association's contribution to the solution of this trouble has been to devise an economic and effective process for oiling blankets during laundering so that the shaking of bacteria into the air during bedmaking is materially lessened.



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VIA A POTENTIOMETER OF 50,000 + 3,000 OHMS
(Pages 12 & 13)

Va	250	250
Vg2	250	
Vg3	-30*	
Ia	10	
Ig2	3.5	
Sm	3.2	
ra	0.1	

OPERATING CONDITIONS -CONTROLLED BY GRIDS 1 A
VIA A POTENTIOMETER OF 50,000 + 4,000 OHMS
WITH Rk = 32 OHMS AND Ck = 50 uuF
(Pages 14 & 15)

Va	250
Vg2	250
Vg3	-20*
Ia	10
Ig2	4
Sm	6
ra	0.2

* Valve not controlled by A.V.C.
** For 10:1 drop in mutual conductance

LIMITING VALUES

Va(b) max.
Va max
Wa max
Ik max
Vg2(b) max
Vg2 max
Wg2 max
Vg1max (Ig1=
Vg3max (Ig3
Rg1 max
Rg3 max
Vh-k
Rh-

C (uuF)
EF50
Va = 250V
Vg2 = 250V
λ = 6M
Cin
Input damping
12
11
10
9
-45
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-30
-25
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Technical Review

R.C.A. SAYS LISTENERS PREFER WIDE RANGE SOUND

**Tests carried out on more than
1000 people by the RCA
Acoustics Research Laboratory
have thrown fresh light on public
eaction to frequency response.
Contrary to previous surveys,
hese tests indicated a preference for music with its full
ange of tones and overtones.**

ONDUCTED by Dr. Harry Olson,
section head of the laboratory,
tests were conducted using a
ll orchestra instead of a loud-
aker as the sound source. The
estra consisted of piano, trumpet,
inet, violin, contrabass, drums and
os. It was placed in a room acousti-
y treated to simulate listening con-
ons in an average living-room.

partition constructed of material
absorbed all tonal frequencies
ve 5000 cycles—the normal limiting
ge of radio reproduction — was
ed between the musicians and the
ence. By revolving movable panels
the partition, this limitation on
quality could be removed, allow-
the music to reach the audience
hanged.

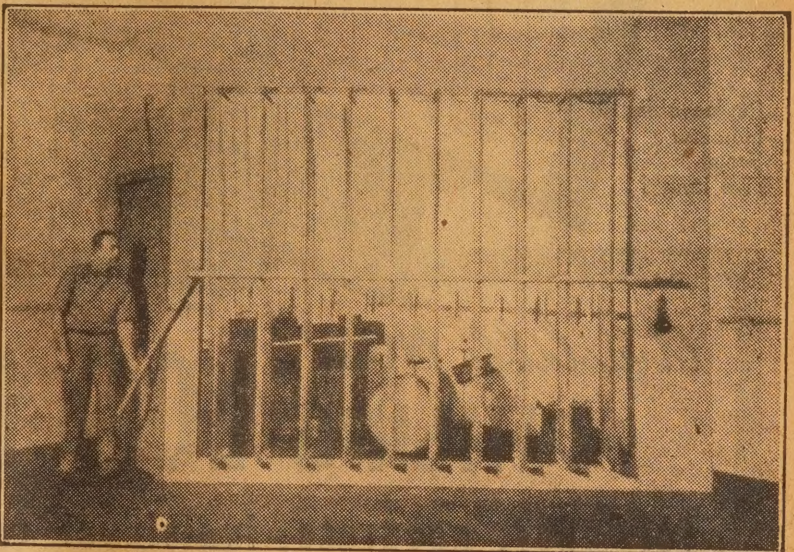
ECT OF AGE

dditional tests with subjects in
ous age groups, Dr. Olson added,
ved that 75 per cent. of listeners
een 30 and 40 preferred the full
uency range of popular music
e only 59 per cent. of those be-
n 14 and 20 expressed apprecia-
for the unrestricted tonal range
his classification of music.

he listeners in the latter age
p," Dr. Olson added, "are probably
enced by listening to radios,
ographs and juke boxes rather
orchestras and are, therefore,
itioned to a restricted frequency
e."

st of the tests are carried out
popular dance music. The small
of the room made it impossible
lay symphonic numbers, but lis-
preference in this direction was
ked with semi-classical selection.
all practical purposes, these results
ed closely with those obtained in
opular-music test.

en tests were carried out on
h, listeners preferred the full fre-
cy range whether the audience was
iar with the speaker's voice or
the voice was being heard for the first time.



For the new tests by RCA, a small orchestra was housed in this special cubicle. The rotating partitions were made of a material absorbing all frequencies higher than about 5000 c/s. Use of an actual orchestra confined the audience reaction purely to frequency response.

In discussing the preferences of listeners for mechanically reproduced music with restricted frequency range, Dr. Olson said that this choice might be due to the distortions of sound which are inherent in common types of reproducing systems.

SMALL TELEVISION CAMERA

SMALL television cameras and high definition pictures are being developed in France. The equipment nearest application is the 819 line system of La Radio Industrie, featuring an inconoscope with a primary image of only 1 cm. square. This camera, called the Eriscope, uses 16 mm. movie camera lenses and has a depth of field from 2 metres to infinity without focusing.

It can be used for normal outdoor work at intensities down to 500 lumens, but still further improvement is envisaged. The camera, which is comparable in size with a newsreel camera, contains the preamplifier and the final stages of the sweep circuits.

Transmission of the double interlaced picture at 50 half frames per second will be at 200 Mc. from a transmitter having a peak power of 1 Kw. Synchronising pulses are to be transmitted by A.M., and 10 Mc. picture band by F.M. and the sound on a separate 200 watt F.M. transmitter.

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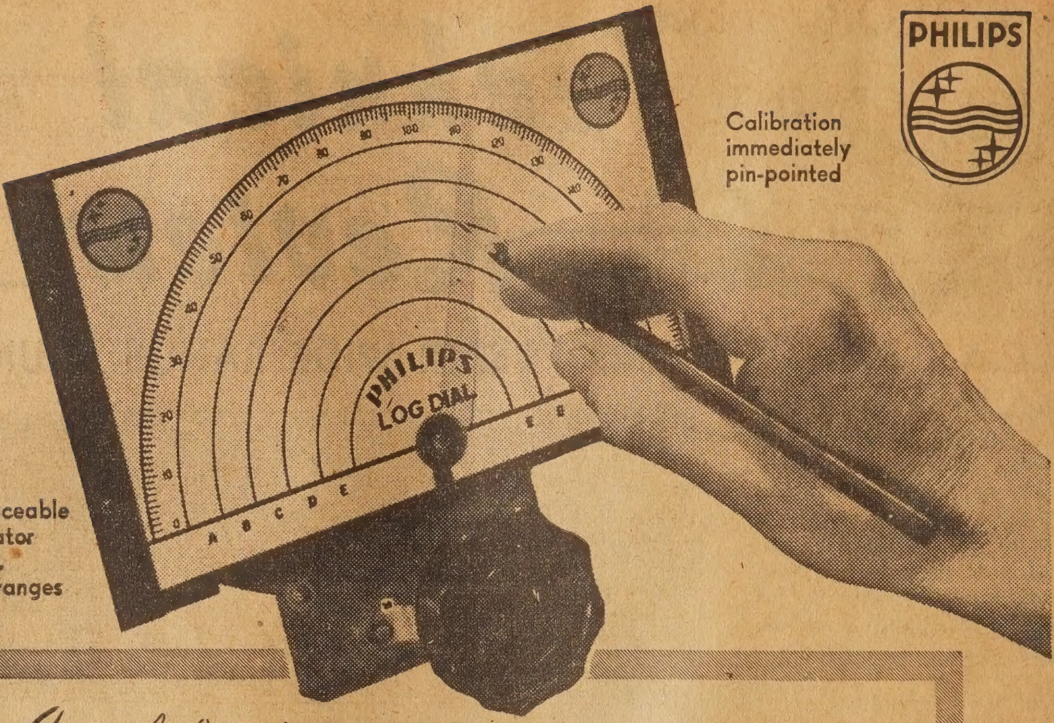

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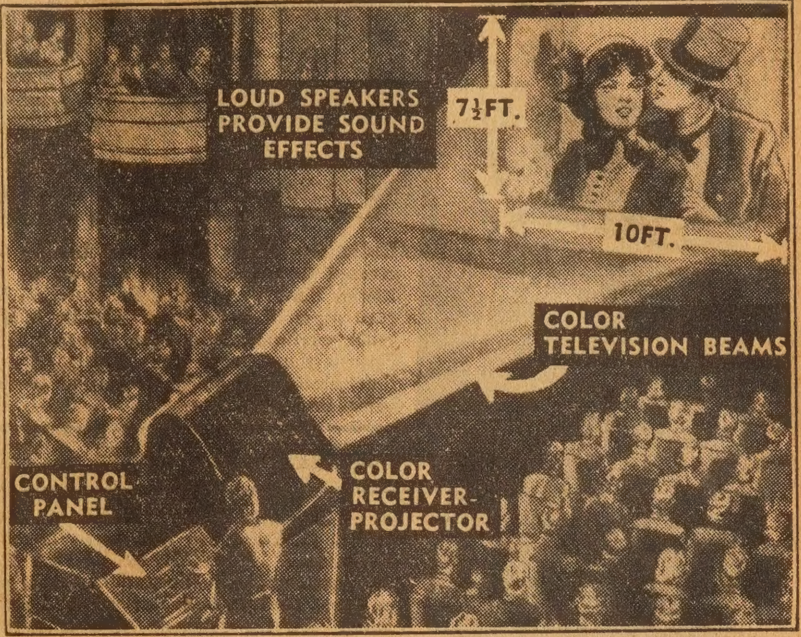
COLOR TELEVISION FOR THEATRES



Large screen color television, as presented by the RCA electronic projector.

N DEVELOPMENT TAGE ONLY

Color television pictures on a 7½ x 10 feet theatre screen were shown publicly for the first time by Radio Corporation of America in a demonstration of its all-electronic color television system at The Franklin Institute, Philadelphia, on April 30. Color motion pictures, films and slides were projected with utmost realism.

R. V. K. ZWORYKIN, who demonstrated the new system to illuste his address on "All-Electronic" lor Television," said that the largeeen system employs the all-elecnic simultaneous method of color evision developed at RCA Laboraies, Princeton, NJ.

However, it was emphasised that, narkable as the advent of largeeen color television pictures appears, must be regarded as still in the oratory stage. Several years would required for its development to the tus of present black-and-white evision.

PARATE IMAGES

n the electronic simultaneous color cess, Dr. Zworykin explained, three arate images in red, green and blue transmitted at the same instant r adjoining television channels of same band-width as used in ndard television.

hen at the all-electronic receiver, the ee-color signals are applied to pice tubes, one with a red phosphor e, one blue and the other green. e flickerless pictures on the face of each kinescope are projected by an optical system to the auditorium screen, where they are superimposed in perfect registration to form a single image blended in the same colors as the original.

Dr. Zworykin pointed out that color television is passing through a series of stages in its progression toward perfection. A great step was made when RCA developed the simultaneous all-electronic color system, which eliminated all mechanical parts and rotating discs.

"This system is completely compatible with existing monochrome television and has other important advantages," he continued. "The simultaneous color television can be made at a time in the future when color television is ready, without obsolescence of the monochrome receiving and transmitting equipment."

Dr. Zworykin disclosed that the pick-up unit used in the demonstration incorporated the electronic "flying spot" which has been under development for nearly ten years. In this system, the flying spot of light is created on the screen of the kinescope by the electron scanning beam.

The light from this spot is projected through color slides or films, scanning the entire surface of the scene or object, point by point. As the light beam, then tinted with color, emerges from the film or slide, it passes through a series of filters which separate respectively the red, green and blue portions of the color in the beam.

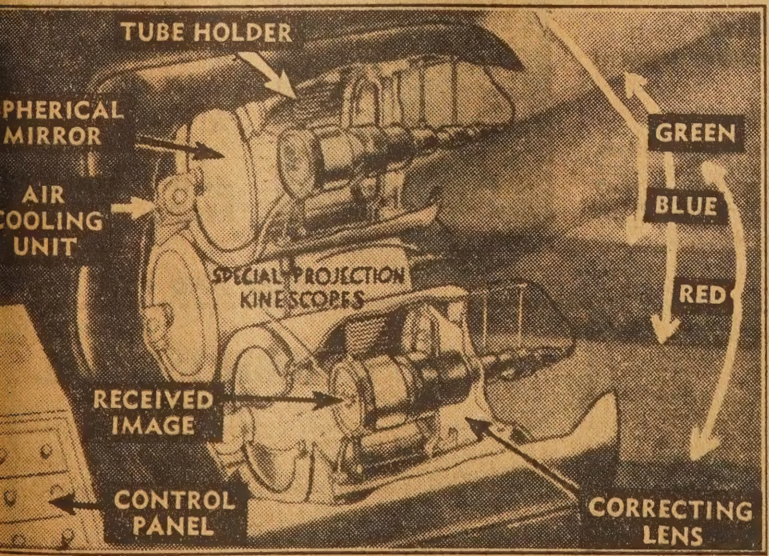
PERFECT REGISTER

Each color then is reflected into photocells which change the light values into electrical signals for transmission to the receiver. The flying spot method, he added, assures perfect picture registration by permitting the transmission of the three color values of each picture element simultaneously.

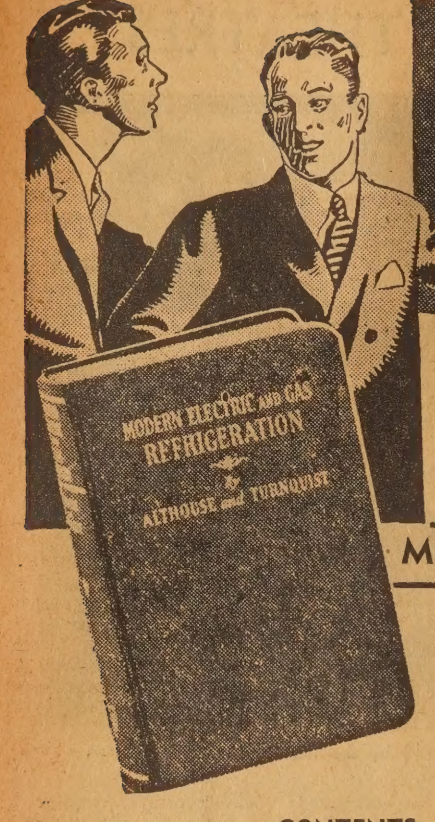
Dr. Zworykin revealed that the special projection kinescopes used in this large screen color television system owed their brightness and effectiveness, in large part, to improvements achieved by RCA since development of the original kinescope.

"Some of these improvements such thing about the untidy little visitor as the design of electron guns to operate at higher voltages and to yield smaller, sharper dots, and the develop-

(Continued on Page 19)



Showing how the three projection kinescopes are arranged within the large electronic color projector.



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(a) for which I enclose payment (b) charge to my Account.

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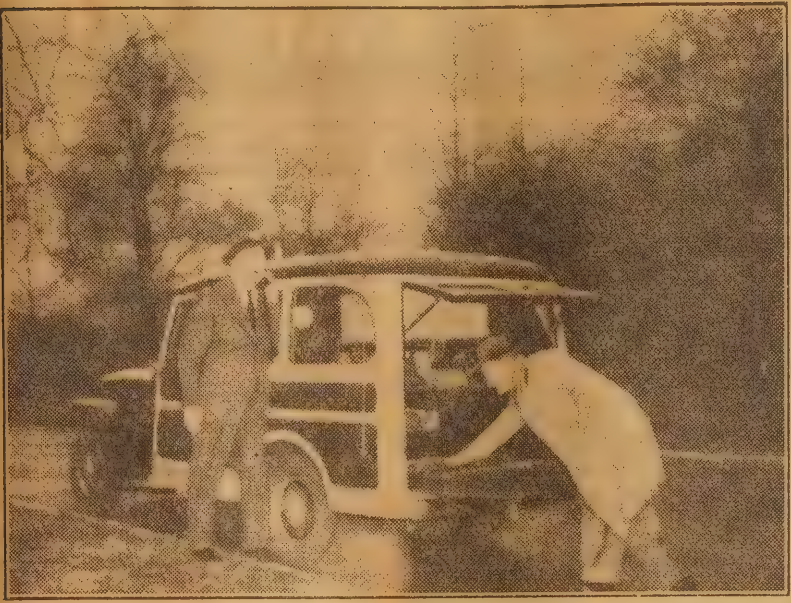
(Tech.R.H. 10/47).

REPORTER RADIOS NEWS PICTURE IN EIGHT MINUTES



Station waggon with mobile radio and picture-transmitting equipment installed.

Radio and wire circuits have already established themselves as a necessary means for conveying spot news photographs from the locale of an event to newspaper plants. Recently successful experiments were completed by the "New York Daily Mirror" in which prints produced in an automobile immediately after exposure were transmitted to the editor's desk in less time than the negatives could have been delivered by usual motor-cycle courier.

THE picture equipment used at both terminals of the test radio circuit comprises a complete picture transmitter and receiver. Clear reproducible photographs up to 8 by 10 inches in size can be sent to any point in the network of stations.

In operation, the photo to be transmitted is wrapped around a cylindrical drum that is motor-driven and synchronised by means of a quartz-crystal oscillator with a comparable drum on the receiving unit. A phototube, scanning the picture in spiral fashion at the rate of 90 rpm, translates the various shades of black, grey and white into electrical currents of varying character. These currents are processed and fed over the lines in the form of an 1800 cps. amplitude-modulated signal to the receiving unit, where they are inversely processed to produce the original picture. Transmission time for a 5in by 7in photograph is about six minutes.

The picture signal for the radio tests was fed to the output of a standard mobile f-m transmitter of the type used for police, taxi-cab, truck and similar service. Frequency of operation during the test was on 158.07 mc., with a total modulation swing of 40 kc., using the Armstrong phase system. The audio response of the equipment is essentially flat from 350 to 5000 cycles.

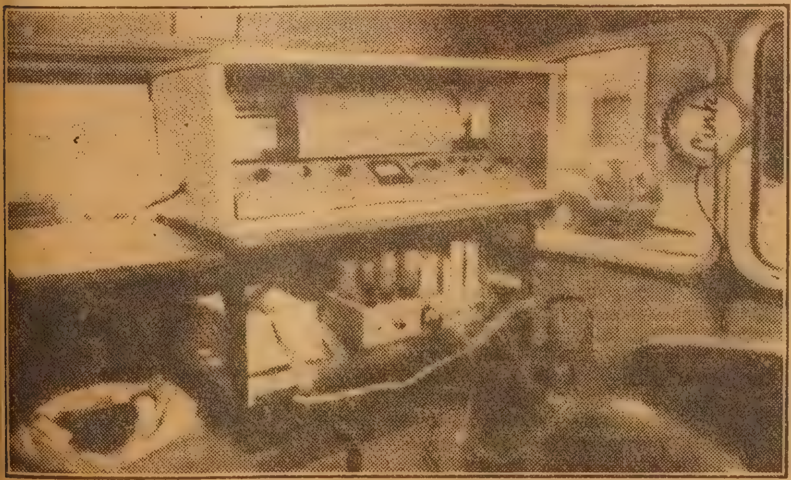
A thin flexible whip antenna, 18 inches long, mounted on the metal roof of the car served as the transmitting antenna.

At the fixed location conventional vhf. transmitter-receiver equipment was installed and connected to a temporary antenna with a power gain of three atop the building. This equipment was remotely controlled from the dark-room operating position several floors below.

Although the initial commercial installation will use a single fixed receiving location common to the talk-back transmitter, a much more extensive receiving system is considered necessary for eventual picture-transmission coverage of metropolitan New York. Probably as many as five separate locations at diverse points will be required to receive good pictures from outlying areas. At these points receivers will be in continuous operation and connected by telephone lines to the central operating post.

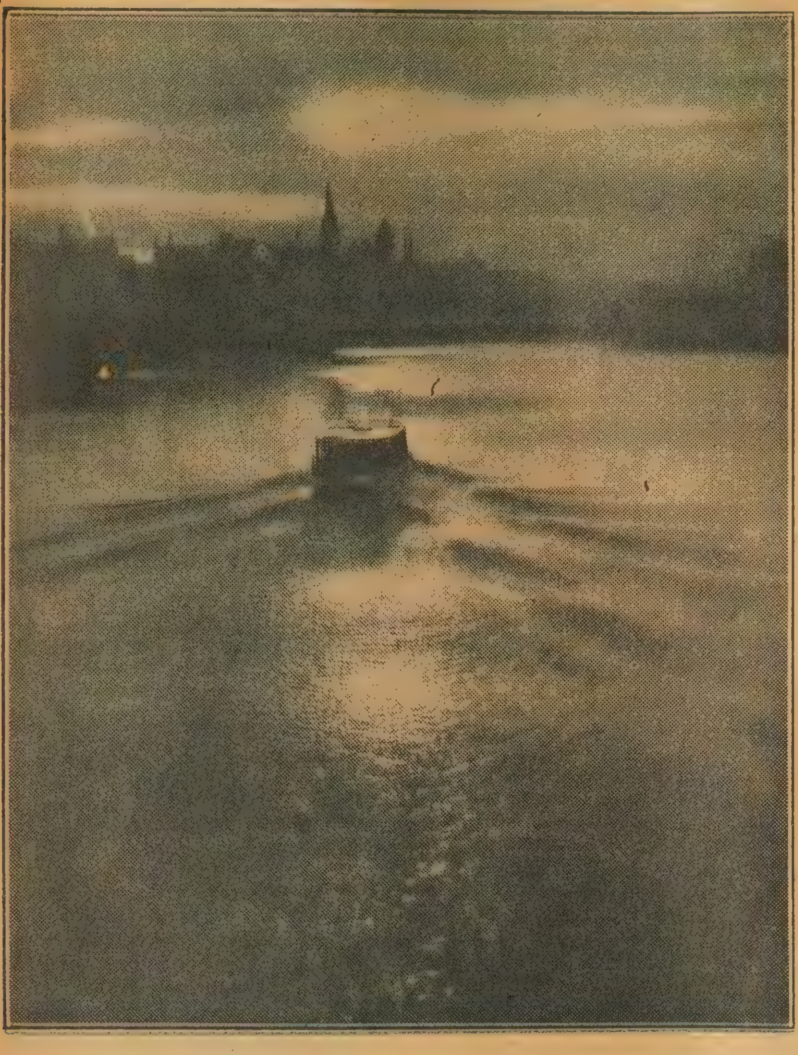
Temporary 152-162 megacycle antenna with a power gain of 3 erected on the building roof.

To further extend the system, portable receiving equipment can be parked near convenient telephone facilities and within receiving range of the mobile phototransmitter. The receiver will then serve as a relay point between the radio and wire links, making it possible to put news shots into the office of every subscriber in the continental network not more than fifteen minutes after the original picture is taken.



Interior of the Jeep station waggon. Standard mobile f-m communication equipment is on the floor. Immediately above are the dynamotor and picture frequency standard, with the sound-photo machine in a lead-lined box on the top of the table.

PROBING SECRETS OF WHITE LIGHT



Early sunrise on Melbourne's Yarra produces a wealth of color values which are really separated components of white light.

The increasing demand for color has brought into being a new profession called Color Engineering. During the last decade the practical use of color has gone beyond clothing, kitchens, furnishings and house painting, and entered the field of industry. The drab walls of factories have been replaced with pleasant colors, and the monotonous black of machinery has been superseded by gay greens, reds, blue and many other colors specially designed to relieve eye strain and fatigue.

The study of color is an interesting one. Of course this has hitherto been the domain of the decorator and the ladies. One sees in show windows and dressmakers' catalogues wonderful new names for colors.

DOES NOT EXIST

Color is not actually a material thing. It does not really exist at all in nature as our eyes perceive it. This is hard, at first, to understand. To a lovelorn youth, the blue eyes of his lady love are very material things indeed, and to an irate wife, the glowing proboscis of her husband, who had lingered too long at the club, is real enough. To tell either that the colors they see are only wave-lengths is to deprive them of one of their emotional outlets. It would certainly not be very romantic for a youth to announce: "Darling, your twenty thousand million wavelength eyes do such wonderful things to me," or the irate wife's anger would be somewhat dampened by having to say to hubby, "And look at your nose. It has so many million wavelengths it glows in the dark."

Yet that is exactly what color is. Red is not red until waves of a certain wavelength impinge on the retina of the eye, and the impulses set up in the optic nerves are translated by the brain into what we see as red. The same holds for all other colors.

Light is due to waves set up in space. These waves are disturbances in the ether, and can be likened to the waves one sees in water. Just as the length of one of these waves is the distance from the crest of one to the crest of the next, so the wavelengths of ether waves are measured, as well as sound, which are waves set up in the atmosphere.

VARIOUS WAVES

A distinction must be made between atmospheric waves and ether waves, the former giving rise to sound, and the latter to ether disturbances, such as light, heat, and electromagnetic waves, this last embracing radio waves. Ether waves are propagated without the necessity for atmosphere.

The number of waves which pass a given point in a unit of time determines the frequency of the wave train. The standard unit of time is one second, so that if a million waves pass a given point in one second, the wave is said to have a frequency of one million.

It has been experimentally demonstrated that waves exist of from a frequency of twenty million million to forty thousand million million, per second. As all these waves, except sound waves, travel at the same speed, namely, 186,000 miles per second, it follows that these waves must be extremely short from crest to crest.

Within the range of ether wave frequencies given above, the eye is responsive to a comparatively narrow band, ranging from a frequency of 390 billion to 700 billion per second. But within this band there is an enormous number of frequencies, each of which has a specific effect on the eye in the production of color.

LIGHT FREQUENCIES

White light consists of all frequencies in the visible range of 390 billion to 700 billion, impinging simultaneously on the retina of the eye. Thus, i white light is broken into its con stituent frequencies by means of a prism or a spectroscope, we have a band of colors ranging from violet t indigo, blue, green, yellow, orange an red. These are the seven colors of th rainbow, which is also produced b white light being broken up by th prismatic effect of raindrops. The ban of colors sometimes thrown on a wa by reflection of sunlight from a mirro is exactly the same seven colors.

In this band of seven colors we hav the whole range of visible frequen

VALUE OF COLOUR IN OUR LIVES

cies, of which the extreme red is of a frequency of 390 billion, and the extreme violet is approximately 790 billion.

When we look at a rainbow we see before us the whole range of colors with which we are familiar. Combinations of these colors produce many more colors, and indeed closer examination of a rainbow will show that the seven main bands of colors are separated by many more shades, which merge from one band to another.

It was Newton who first opened the door to a knowledge of the behavior of white light, for it was he who discovered the spectroscope, and from whose researches our present knowledge is derived. When Newton discovered that a sunbeam consists roughly of seven varieties of visible light, he also discovered the fundamental basis underlying the phenomena of color.

SELECTIVE ABSORPTION

What, then, causes various substances to appear in different colors? What is responsible for the gorgeous colors of flowers and fruits? The answer lies in what is known as the doctrine of "selective absorption." Simply put, this means that a substance possesses the property of being able to absorb entirely all but certain light rays lying within the visible spectrum, the other rays being reflected.

Observe a blue flower on which the sunlight is shining, or any other white light, for that matter. Since it appears blue, it is apparent that all the light rays corresponding to violet, indigo, green, yellow, orange and red have been somehow absorbed by the surface of the flower. The blue rays have been reflected to the eye with the consequent translation by the brain into a sensation of blue. The same principle applies to all other colors, no matter what the substance is which possesses the color. It may be a flower, a dye, a paint, or other substance.

The paper upon which this article is printed is white because ALL rays are reflected from its surface and none absorbed, the eye thus receiving an admixture of ALL rays. On the other hand, the ink with which the article is printed is black because it ABSORBS all the rays, and none are reflected from the surface to the eye. Simple, isn't it? (Or is it?)

This property of white of reflecting all rays is made use of in the painting of roofs in hot climates. White also reflects heat rays, and therefore roofs are painted white to gain the maximum of reflection. Black is rejected for the reverse reason.

HUES AND VALUES

The color grey is produced when part of all rays are reflected and part absorbed. Colors differ not only in "hue," which is the difference between red and blue, or green and yellow, and so on. They also differ in "value." This is the difference in two colors of the same "hue." It can also be called "intensity," such as red, carmine, vermillion and the multitude of other reds and the wide variety of greens, blues, and so on. This is due to the differences in the amount of light reflected. There is also the difference in "purity" of colors. This depends on the amount of greyness in the colors. Thus, adding white to any "hue" gives us tints, because it alters the amount of light reflected from the surface. In other words, the white, reflecting as it does ALL the rays, tends to overpower the rays coming from the "hue" and dilutes them, as it were. Adding black forms "shades" by increasing the absorption powers of the "hues."

SUBJECTIVE COLORS

We have so far dealt with colors which have an objective reality because they result from the breaking up of white light by external objects. There are, however, certain "subjective" colors which are really tricks performed on us by a particular condition of the eye.

These tricks are caused by the eyes becoming color-weary owing to certain strains. For instance, there is the well-known optical illusion of gazing steadily at a red object for some time and then suddenly transferring the gaze to a white wall or paper. The image of the object will be seen upon the wall, but in a bluish-green color. This is caused by the eye becoming tired of the red rays emitted by the object, and thus is only able to see well those rays emitted from the white wall which are not like the red rays of the object. The bluish-green of the image on the white wall is said to be complimentary to the red.

If the original image had been any of the other colors of the spectrum, the complimentary colors seen would be as follows (the complimentary colors follow the spectrum colors):

by Calvin Walters

Violet and yellow, indigo and orange-yellow, blue and orange-red, green and reddish-violet, yellow and indigo, orange and blue, red and bluish-green.

One writer has reported that on gazing for a full half-hour at the flames of a house on fire he transferred his gaze at the moon, which appeared blue. It appears, therefore, that a "blue moon" can be a "subjective" reality. Probably "pink elephants" and "purple snakes" may be explained in the same way. The practical application of the phenomenon of "subjective colors" in industry will be dealt with presently.

Transparent objects appear to be a certain color because of their ability to allow certain rays to pass through whilst rejecting others, so that a glass is red only when it allows red rays to pass through, and so with all other colors. By projecting light through glasses of various colors, various mixtures can be obtained with a great variety of colors, just as mixing pigments of various colors can produce other colors.

How does the eye see only one color from an admixture of several? The eye responds to any mixture of single colors which impinges on a single spot on the retina. The result is a sensation of a single color which may not necessarily resemble any of the colors in the original mixture. The retina of the eye contains nerves each of which has the property of being able to perceive one of the three primary colors red, blue or green.

COLOR REACTION

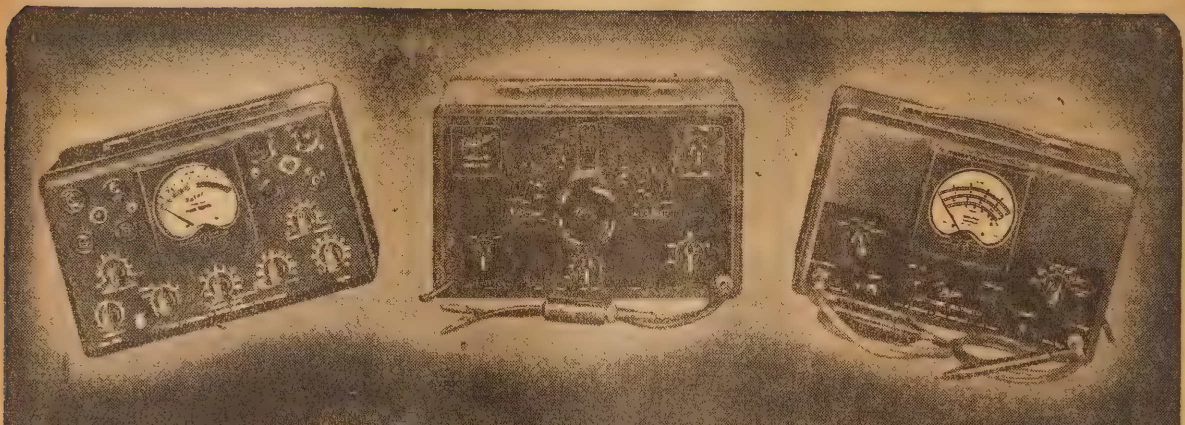
Should the nerves sensitive to red and those sensitive to green be acted upon simultaneously, there will be produced, according to the degree and intensity of the "irritation," any color of the spectrum from red to green (through yellow and orange). Green and violet lights which are blended in different proportions will produce the intermediate blues. When all the three sets of nerves are acted upon simultaneously there is still a sensation of a single color or perhaps of white only.

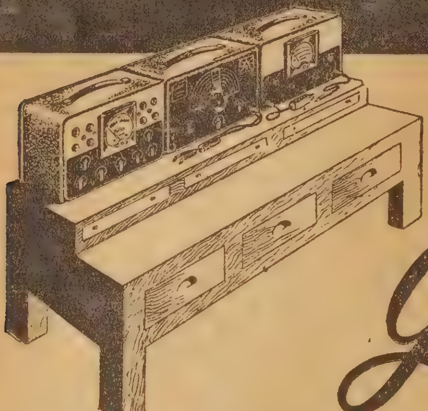
Practically every instance of a single colored light is really an admixture of several single colors. This can be proved by passing white light through say a green glass. Analysing this light with a spectroscope will reveal that what we really see as green light consists of not only green but also blue and yellow and may be red and violet. The resultant sensation is, however, one of green.

The writer has produced some wonderful effects for stage work by the use of different colored glasses. These project colored light on to a white background upon which is thrown shadows. The resultant effect is a wonderful display of kaleidoscopic colors of many hues. With three colored glasses many different colored shadows are produced. It is possible with red, green and blue glasses to produce shadows ranging through all the colors of the spectrum when the glasses are used simultaneously.

IN INDUSTRY

The use of color in industry has its foundation partly in the phenomenon of "color tiredness" as mentioned previously. It has also been found that color of surroundings has a distinct effect on the apparent temperature of





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Vernier Dial 54:1 ratio, calibration accuracy 1%.

Has cathode follower to prevent frequency modulation and attenuator reaction.

Signal generator pattern attenuator of five steps: impedance 11 ohms on lower settings.

Triple shielding and adequate filtering ensures a leakage of less than 1 microvolt at all frequencies.

Supplied complete with detachable dummy antenna, co-axial leads and 24-page instruction book.

Price: £32/17/6, plus tax.

Note: Each of these instruments is A.C. operated, 200-260 volts, 50 C.P.S., and can be operated from a battery by using external vibrator unit.

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(2) High resistance D.C. six-range voltmeter: 0-2.5-10-25-100-250-1,000 volts D.C. Total load 11 megohms—giving over 4 megohms per volt on lowest range.

(3) Ohmmeter, six-range — from 0.5 ohms to 1,000 megohms.

Detachable co-axial leads, 20-page instruction book supplied. Employs 4 valves. Price: £29/10/-, plus tax.

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P.18.FP

rooms. In one factory the temperature was kept at 72 degrees, yet girls complained of cold. The walls were repainted a warm, coral color and the complaints ceased. Color also has an effect on apparent weight of objects. Boxes painted black were too heavy to lift, some operators complained. The foreman, on the advice of a color engineer, had the boxes painted a pale green over one weekend. On Monday, general approval was given the new "lightweight" boxes.

STIMULATING RED

It is generally accepted that colors bordering around the red end of the spectrum are stimulating and those around the blue and green are cooler and relaxing. Telephone boxes when painted red have proved to be less tempting for long conversations than those painted sombre colors. Restaurants have had their turnover increased because their blue-green interior was repainted in red and yellow. The blue-green tended to cause customers to linger too long over their meals, thus limiting turnover.

In London, Blackfriars Bridge was painted black. The bridge was noted for its large number of suicides. The authorities, on advice, changed the paintwork to bright green and suicides decreased by over one-third.

It has been proved that red is the prime stimulator to action in sales requiring quick decisions. Thus an American petrol company increased the sales of its first grade petrol by painting the particular pump bright red. Sales increased by 50 per cent. All the other pumps were painted bright green and these also had increased sales, but only 15 per cent. greater.

FOR FACTORIES

During the war color engineers in America developed complete color schemes for factories designed to decrease eye strain and increase production. Bodies of machines were painted light grey. Working areas cream. Ceilings are white and some walls are grey-green. Floors are sometimes buff or grey. Fire fighting equipment is of course red, while dangerous spots, such as low beams, edges of platforms and the like, are yellow striped with black. Electrical switch-boxes are blue.

This scheme has proved to increase lighting sometimes by as much as 100 per cent, increase production by over 15 per cent, accuracy by 40 per cent, and reduction of absenteeism by 60 per cent. One firm maintains that in 60 days it saved the cost of the painting in the recovery of small parts that were previously overlooked on the drab floor.

SPECIAL PROBLEM

In textile factories where girls gaze at one-colored fabric for hours on end the painting of the walls white may have a detrimental effect. One American factory reported that after gazing at blue fabric and then raising their eyes to the white wall a peach color appeared before their eyes and it was several seconds before the girls could regain their normal vision when again looking at the fabric. Color engineers solved the problem by painting the walls a peach color.

Much more could be said, if space permitted, about the effects of color on insects. How blue repels flies but encourages mosquitoes. How barnacles in the sea are repelled by light green or white. However, enough has been said to encourage a greater study of color in our everyday existence so that our work will be not only more pleasant but safer and more efficient.

SCIENCE NOTES — BY PROF. A. M. LOW

FAMOUS ENGLISH WRITER ON POPULAR SCIENCE

Not so long ago I happened to witness a number of fires all round me. It is interesting to think that by touring London at such a time with an instrument consisting of little more than a prism made from an old-fashioned chandelier or a cheap lens, one could estimate the nature of all the materials on fire.

ATMOSPHERE also contains minute quantities of other gases such as neon—you see its effect in modern lighting—and argon, a valuable gas used to prevent electric light bulb filaments from wastage at high temperature. All these materials are made from air by apparatus which, in itself, is a romantic story. Queerly enough, the microscopic quantities of rare gases in air help to keep us healthy!

THINKING UP A POT OF JAM

You will have noticed from the Press, and therefore you will have known that it is true, that the energy in atoms must have been "put there," as it were, by the sun in its heat and, at its birth. Star dust is made more romantic by a little knowledge, and not less so, as has been said by people who do not grasp, fortunately, that scientists are as ignorant as anyone else.

We know, it seems, that matter can be converted into energy by a bomb, and we also know that in the preparation of the uranium family we can seemingly create a new element from "bricks," of which it is basically constructed. Call them electric particles if you prefer.

Now, if matter is energy at partial rest, and if energy can go through the ether, why not, in the vastly distant future, transfer material things by radio? The Betatron may be a beginning. An Atlantic flight was represented by a two-yard hop only yesterday in the realms of time.

More exciting still is it that thought also is energy. It even produces ether waves. I remarked long ago that I felt very small indeed beside the man of the few million, million years hence, who might look positively frightful with atrophied legs, artificial aids to everything, no hair and no teeth. But supposing he could think, a pot of raspberry jam across the Atlantic, that would be far more interesting than the best of bodies. As far as I am concerned at the moment it would be an extraordinarily desirable accomplishment.

I was amazed, as the headlines say, to find that every fire had a distinctive color. Due in some cases to dust or moisture in the atmosphere, but usually, I think, to the materials concerned. Perhaps they were of interest to another world where peculiar people are saying, "They are lucky to have so much carbon in such convenient form."

I feel that the early savages who made fires by rubbing sticks together, a most trying business which seems to warm the person concerned more than the sticks, must have noticed the many colors achieved by their fires. Built on sand, these fires may have shown the yellow of sodium; built on rock, prhaps the green of copper. Every district must have had its own local characteristics.

NO WONDER WE BREATHE

Breathing is a habit. A very good one, I imagine, but here is a very interesting thing, and this is about air. Of course it makes the green fields, we breathe it, and it is pleasant. But it is so much more than just "air." Aeroplanes fly in it, but without some of the queer substances it contains their manufacture might be slowed down by 30 per cent.

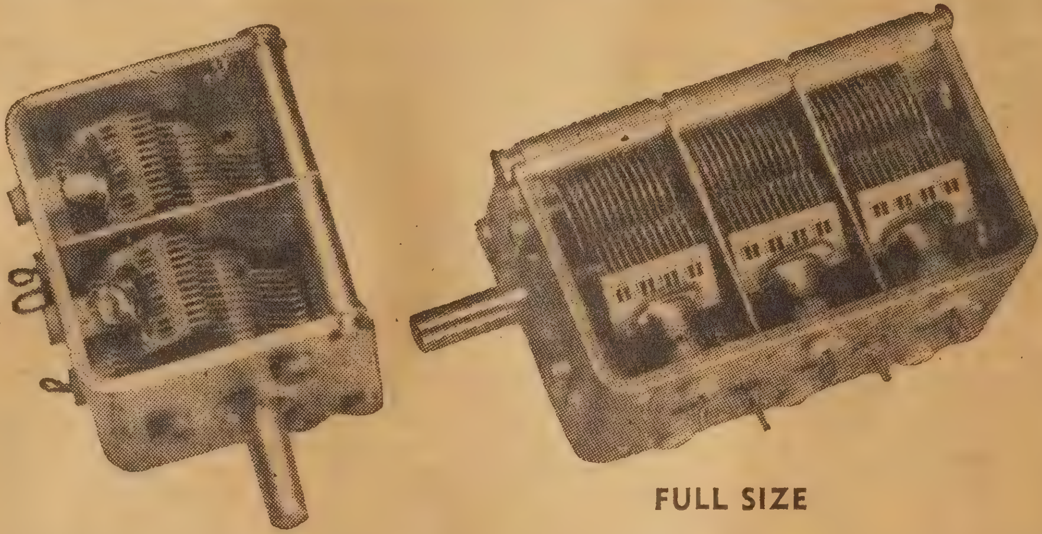
Air is mainly a mixture of 21 parts oxygen and 79 nitrogen. It was this nitrogen that saved Germany from a nitrate shortage in 1914, that might have slowed up production of explosives and fertilisers. Today, the separation of air into its various component gases has enabled almost every form of industrial and manufacturing process to be vastly speeded up.

Oxygen is a great "speeder up." There was a time when it was just used ocassionally in hospitals to help sick lungs and hearts and to heal wounds. Now oxygen is one of the most vital tools known to the engineer. It welds, it cuts, builds gun mountings and salvages ships in a miraculous fashion.

Nitrogen, too, is almost as important. Unlike oxygen, it is a very lazy gas which never wants to join with anything else. So it can be used for preserviing food. Just think what would happen in tinned foodstuffs if they were sealed up with air—rust, fermentation and waste. Not so when nitrogen is all around. Nitrogen, in a sense feeds the world in more ways than one, for, given good canning and dehydration, famines can be abolished.

YOU LITTLE BEAUTY!

POLAR ENGLISH MIDGET CONDENSERS



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A REVELATION IN ENGINEERING DESIGN—2 GANG SIZE, 1½" x 1½" x 2" DEEP—CERAMIC INSULATED—AIR DIELECTRIC BROAD CAST GANG—CAPACITY 363mmfd.

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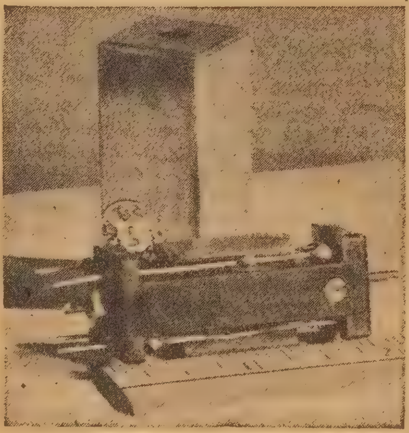

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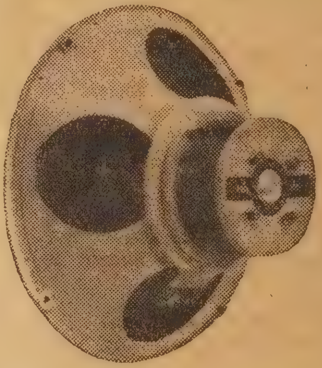

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ERA OF PUSH-BUTTON TELEGRAPHY

PUSH-BUTTON TELEGRAPHY.—In the field of telegraphy, it is only natural that electrical devices should gradually replace other methods of doing jobs with a consequent saving of time and labor. An example of this process on a large scale is seen in the Philadelphia offices of Western Union when a new system costing about £750,000 was introduced by which push-button control takes the place of old-fashioned routing of messages.

Tripling the capacity of present wire systems, the new method relays messages to any of 270 points with the pushing of a button. Now in partial operation, push-button telegraphy will operate fully this month. It is the first of a series of such systems to be set up across the country. Under the old system, outgoing messages are sorted by routing clerks and carried by roller-skated girls to operators, who send the telegrams from their typewriters—like keyboards. The new system eliminates these steps. Each message is typed just once, at the point of origin. A printer perforator simultaneously prints the message and punches holes in a paper tape. A button is pushed, the tape runs through an electrical transmitter, and the message comes out in printed form at its destination, ready for delivery.

Picture shows operators at work at the new push-button boards in the Philadelphia Centre.

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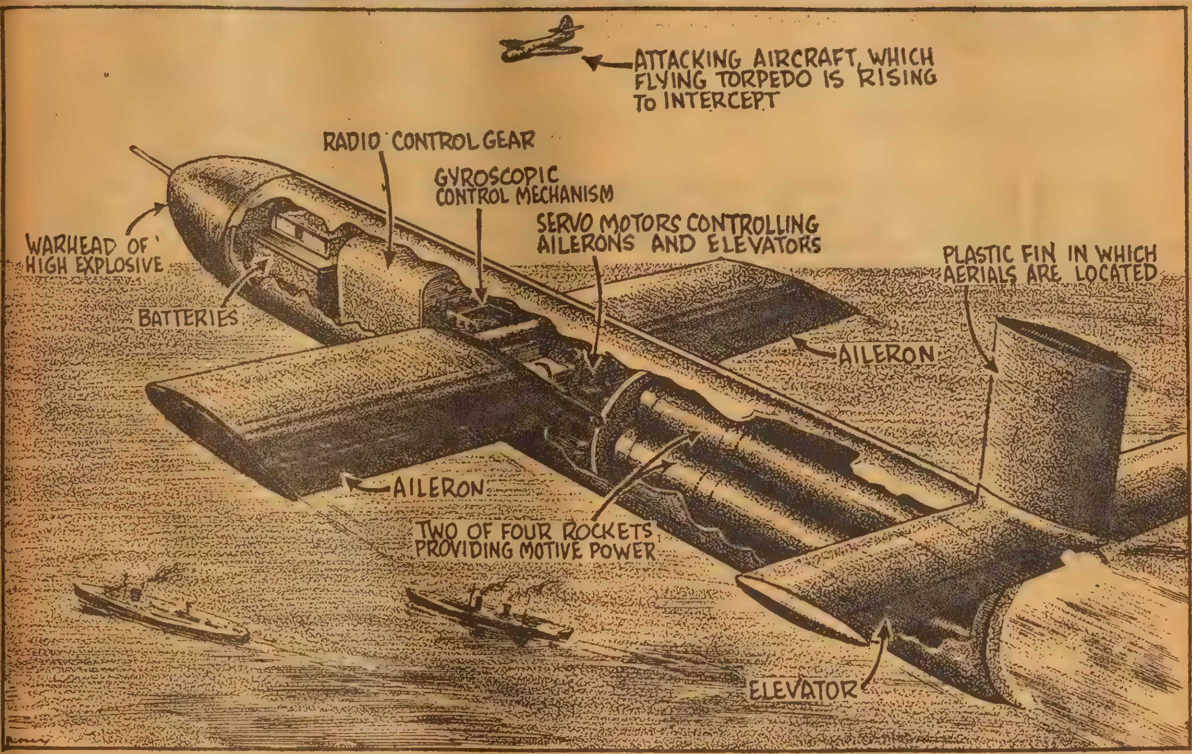
BRITAIN HAS THIS FLYING TORPEDO


ATTACKING AIRCRAFT, WHICH FLYING TORPEDO IS RISING TO INTERCEPT
RADIO CONTROL GEAR
GYROSCOPIC CONTROL MECHANISM
SERVO MOTORS CONTROLLING AILERONS AND ELEVATORS
WARHEAD OF HIGH EXPLOSIVE
BATTERIES
PLASTIC FIN IN WHICH AERIALS ARE LOCATED
AILERON
AILERON
TWO OF FOUR ROCKETS PROVIDING MOTIVE POWER
ELEVATOR

A pilotless rocket-powered "flying torpedo" that can be directed by radio control to intercept an attacking aircraft has been developed in Britain. Some details of the device were revealed recently when it was announced that the "flying torpedo" had successfully completed a full range of flight trials.

THIS missile, the first British device of it's type, is in many ways a development of the Grman V-1 flying bomb. It is, however, operated under direct radio control, and not by predetermined gyroscopic control.

Designed and developed by the Fairey Aviation Company, the "flying torpedo" is of orthodox monoplane design. The stub wings are placed almost half-way back along the length of the circular fuselage, which contains warhead, batteries for power for radio and gyroscope, motors that operate control surfaces, and rocket tubes.

For take-off, the missile is mounted on the rails of a ramp of light metal structure. The 10ft. launching cradle can be assembled by four men in less than a minute and a half.

To assist in giving the maximum nitial speed, four booster rockets are itted externally, mounted in pairs on each side of the fuselage.

After a second and a half of flight, he boosters are jettisoned by small xplosive charges and the projectile ontinues on its way under its own ocket power. The four rocket tubes are each five inches in diameter. They eed their exhaust gases through a enturi tube to the near nozzle.

Remote flight control is exercised by moving a "joystick" mounted in a ontrol box on the ground or aboard ship. A radio transmitter linked to the box relays "messages" as signals on set frequencies, and these are picked up by the radio equipment in the missile, where they activate servomotors operating the control surfaces.

The control surfaces of the "flying torpedo" consist of ailerons on the wings and elevators on the tailplane. Full flight control is maintained by these surfaces and the fin has no rudder attached.

The projectile is 7ft. 6in. long and its wingspan is just under 7ft.

This "flying torpedo" is a variant of the "Butterfly" experimental rocket developed by the Germans in the latter stages of World War II. It was designed to trail down aircraft by means of its acoustic "ear" and "radio eye."

It was to be fired into the area of attacking planes. Radio waves were emitted and their echoes from any object within range were picked up by the sensitive mechanism. Control surfaces operated in accordance with wave echoes received, so that the 600-miles-an-hour missile might follow its quarry and strike it down, despite any evading action the plane might take.

COLOR TELEVISION IN THE U.S.A.

(Continued from Page 9)

ment of efficient phosphors, with a wide range of color, have been practically continuous," Dr. Zworykin said. "Other important contributions of relatively recent date, are the use of metal backing for the fluorescent face of the tube and the utilisation of an improved optical system.

Television of theatre-screen size in life-like colors represents "a spectacular advance in the art of sight-and-sound broadcasting, and holds fascinating prospects for the future," declared E. W. Engstrom, who co-operated with Dr. Zworykin in the Philadelphia demonstration.

Revealing the next big step to be expected in the evolution of color television, Mr. Engstrom said that cameras and other necessary apparatus are being developed at the laboratories, which will enable a demonstration of color television featuring outdoor scenes in motion.

In looking to the future, Mr. Engstrom said that it is the plan of Radio Corporation of America to perfect color television in such a manner that ultimately it will take its place alongside the RCA all-electronic black-and-white television system.

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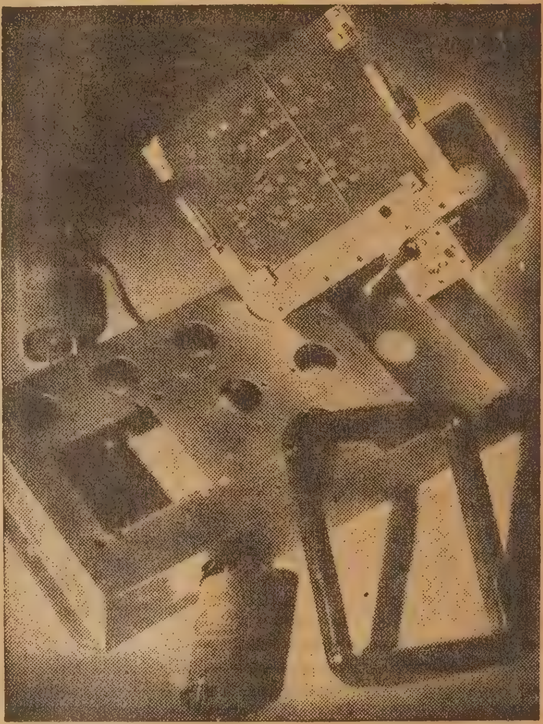

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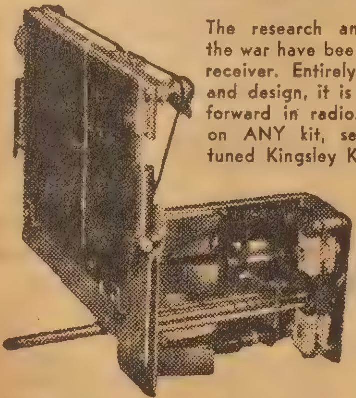

The research and developments of the war have been applied to this new receiver. Entirely new in conception and design, it is a revolutionary step forward in radio. Before you decide on ANY kit, see the permeability-tuned Kingsley Kit.

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★ **MODEL K.F.T.3. COMPLETE**
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NEWS AND VIEWS OF THE MONTH

THE results of the Atlantic Convention which decides what frequencies shall be used for the world's services during the next five years are slowly seeing the light of day. Most of the decisions are of indirect interest only to the general public. To our readers, the decisions concerning amateur bands are probably the most important, for although the entire amateur fraternity represents only a small fraction of our total readers, many of the remainder listen to amateur activity at one time or another.

So far, the only change which seems definite is the lopping of 50kc from the end of the 20 metre band, making it 14mc., to 14.350mc., and the sharing of the section 14.250-14,350kc., with the Russians for their own internal or domestic use. Just what this latter provision amounts to is not clear, but there it is, and despite the worthy efforts of amateur organisations there it will probably remain.

A NEW BAND

There may be a small curtailment on the 3.5mc. band which isn't likely to be serious, but there is a very definite prospect of an entirely new band 450kc. wide in the vicinity of 21mc.

We don't like to see any of the recognised frequencies of the amateurs curtailed, and wish those who hope to restore the cuts every success. But even if they remain, we can't see that the final reshuffle is nearly as bad as many would imagine.

The 100 kc. allocated to Russia is an unknown quantity, although if the American high powered stations work in that region, it's hard to see what use it would be to anyone else. It is almost certain that this will happen, as the Americans are very sore about this aspect of the business. But the new band is likely to prove more than a compensation, and no doubt this view was held very strongly when the cuts were allowed.

Listeners to 13 and 16 metre overseas' broadcasts are familiar with the fine signals which are to be heard when these bands do "open." It is likely that 21mc. will exhibit many more inconsistencies than the 14mc. band, but this in itself, will give an added interest to its use. It is near enough to 14mc. for much the same general techniques to apply, and receiver and transmitter efficiency should be quite easy to obtain. Also it is in harmonic relationship with the other bands lower in frequency.

BE OPTIMISTIC

So although we are sympathetic with those, and regret the treatment they have received, we are by no means of the view, that our familiar DX, particularly on phone, has been ruined. On the contrary, we expect the new band to greatly relieve the congestion now apparent on 14mc. It may, when considered as "stations per kilocycles," actually leave us better off than before.

So don't be too gloomy, fellows, until you have a chance to try it out. It may prove to be a blessing in disguise.

Incidentally, there is also a rumor that the 50-54mc. band will give place to the older 56-60mc. band, as in prewar days. This is relatively unimportant as a change, although it probably means that the UHF DX won't

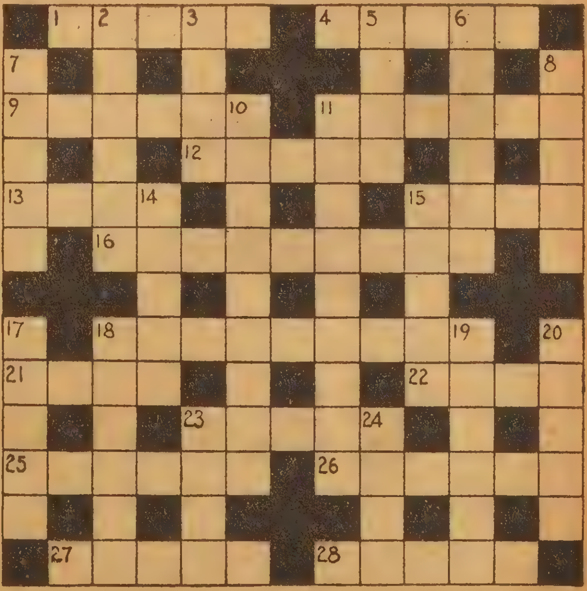
RADIO CROSS-WORD PUZZLE, No. 2.

ACROSS

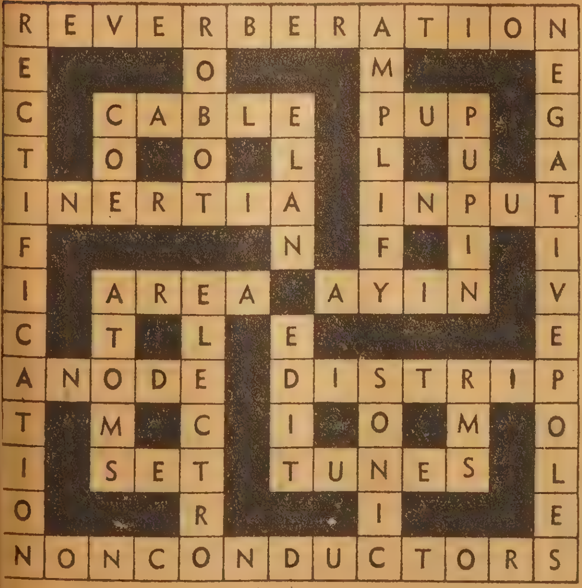
1. Perspire.
4. Code.
9. Units of capacity.
11. Unit of current.
12. Channel (Med.).
13. Small particles.
15. One million times the unit.
16. These step up voltage.
18. Transmitter component.
21. Type of frequency.
22. Type of armature winding.
23. Value.
25. Put in tune.
26. Good conductor.
27. Wire shielding.
28. Viper.

DOWN

2. Collection of conductors.
3. Used for hearing.
5. Units of resistance.
6. Device for sowing seeds.
7. Attach.
8. Device for opening and closing circuits.
10. Arc denoting rise and fall of voltage.
11. . . . Volume control.
14. Bristle.
15. Electrical machine.
17. Attempt.
18. Be of importance.
19. Type of voltage.
20. Market place.
23. , , . Capacity switch.
24. Across a generator.



BELOW:—LAST MONTH'S SOULTION



R	E	V	E	R	B	E	R	A	T	I	O	N
E	■	■	■	O	■	■	■	M	■	■	■	E
C	■	C	A	B	L	E	■	P	U	P	■	G
T	■	O	■	O	■	L	■	L	■	U	■	A
I	N	E	R	T	I	A	■	I	N	P	U	T
F	■	■	■	■	■	N	■	F	■	I	■	I
I	■	A	R	E	A	■	A	Y	I	N	■	V
C	■	T	■	L	■	E	■	■	■	■	■	E
A	N	O	D	E	■	D	I	S	T	R	I	P
T	■	M	■	C	■	I	■	O	■	M	■	O
I	■	S	E	T	■	T	U	N	E	S	■	L
O	■	■	■	R	■	■	■	I	■	■	■	E
N	O	N	C	O	N	D	U	C	T	O	R	S

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HERE IT IS! THE NEW
SIGNAL TRACER!
SIGNAL VOLTS
UNIVERSITY
ANOTHER "FIRST" FROM University

WHAT IT IS . . .

It's a Signal Tracer—the most versatile and fool proof instrument that has ever been designed for speedy and economical radio service work and general fault finding. It is built into an attractive brocaded steel case with a leather carrying handle and all necessary tests leads and instructions are supplied. It embodies one of the famous "University" four inch square meters together with a new 3½" permagnetic speaker. Standard type easily replaceable batteries are built internally and a book of instructions explains the uses and shows how signal tracing is the latest up-to-date method of service work. You hear the signal in the speaker—and you see the signal on the meter.

WHAT IT DOES . . .

Spearhead of this most efficient instrument is the probe. This is a bakelite moulding into which is built one of the new bantam type valves. It actually traces the path of the signal RIGHT THROUGH the radio receiver from START TO FINISH. It can be used just as effectively on amplifiers or intercommunication systems and will give the same effectiveness and speedy service. When the probe strikes the faulty section, indications are given by the meter and speaker both. It will indicate clearly and easily faults in coils, condensers, intermediate frequency transformers, components, as the signal is traced.

This is the instrument you MUST have—a necessity in every place where radio work is being done. Quantities are limited, so place your order early. Ask for model S.T.B. "University" Signal Tracer.

Price
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e as easy to achieve as formerly. Even this point, however, has yet to be demonstrated.

While on the matter of amateurs, there is a point we have felt strongly about for some time, in conjunction with many others who like to hear good operating.

It concerns the use, or rather the misuse of VFO's by many stations on 7 and 14mc.

It is a grand thing to have control of frequency in such a manner that one can move accurately to any spot in the bands. When working another station, it is economical in channels to move over to his frequency, thus in effect, doubling the number of channels which can be used.

But the practice of using the VFO to break in on another man's QSO, as we have heard so often in recent months, is, apart from being bad operating and against regulations, more often than not, sheer bad manners.

On one occasion recently, we were listening to a number of stations operating as a network, where this breaking in on each other' transmissions with snappy remarks was carried to such a pitch that at one time four stations were trying to talk at once, none of them being intelligible.

What possible good such bedlam can do, is hard to imagine. The effect on the general listener is far from happy. We must remember when we talk of the general public's reaction to amateur radio and its doings, that our transmissions are our best advertisement — our shop window. It's a mighty poor advertisement to fill the air with such twaddle, presented in such a manner as to create an almighty jumble and etheric chaos.

Use a little more thought, fellows, and clean up this poor operating. It isn't necessary, and it's illegal. You'll raise the prestige of your own station by so doing, and even guard against receiving the wrong kind of ticket when the authorities get fed-up with his state of affairs. The Atlantic Convention is surely sufficient reminder hat we must be able to prove our worth and fitness to use the bands before what amounts to an International Tribune. Don't be one of those who bring amateur radio into disrepute.

.M.—OFFICIAL

THERE are no immediate prospects of frequency modulation broadcasting being introduced into Ausralia to replace the existing system.

This statement was made officially y the Postmaster-General (Senator Cameron) who said that despite a orecast which had been made in a ecent National news broadcast conerning FM broadcasting, several years ould elapse before this system could upplement, much less replace, existg stations. The wireless sets at resent used by listeners, of whom here were 1,700,000 in Australia, were capable of receiving FM transmisons and, even if it were decided to troduce the FM system, a duplicate oadcasting service would have to be aintained over a very long period ntil virtually all listeners had obtained itable receivers.

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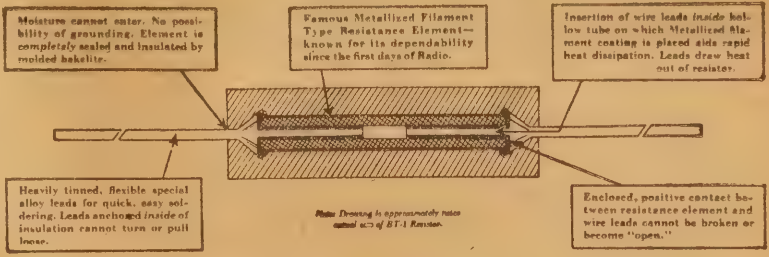
The Type BT Resistor, with its many superior features and special practical advantages, is the final result of more than twenty-three years of intense research and development work on the part of IRC engineers.

The time-tried Metallized filament principle is retained, but the ingenious construction, firmly based upon sound engineering principles, insures low operating temperatures with proportionately higher wattage dissipation in a conveniently small, sturdy, light weight, fully insulated unit with an exceptionally low noise level.



Moisture cannot enter. No possibility of grounding. Element is *completely* sealed and insulated by molded bakelite.

Famous Metallized Filament Type Resistance Element—known for its dependability since the first days of Radio.

Insertion of wire leads *inside* hollow tube on which Metallized filament coating is placed aids rapid heat dissipation. Leads draw heat out of resistor.

Heavily tinned, flexible special alloy leads for quick, easy soldering. Leads anchored *inside* of insulation cannot turn or pull loose.

Note: Drawing is approximately twice actual size of BT-1 Resistor.

Enclosed, positive contact between resistance element and wire leads cannot be broken or become "open."

Available in ½w., 1w., 2w. sizes

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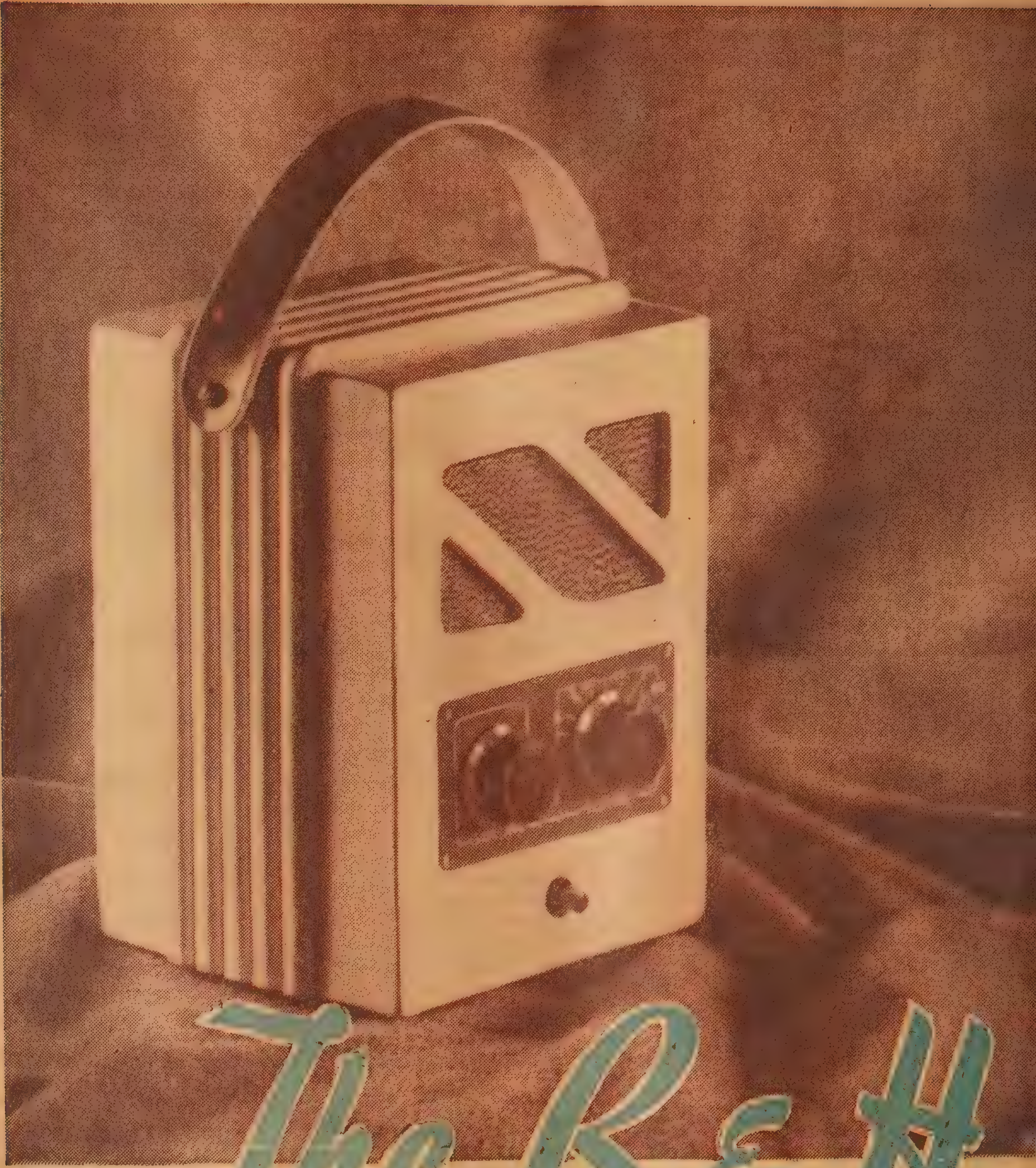
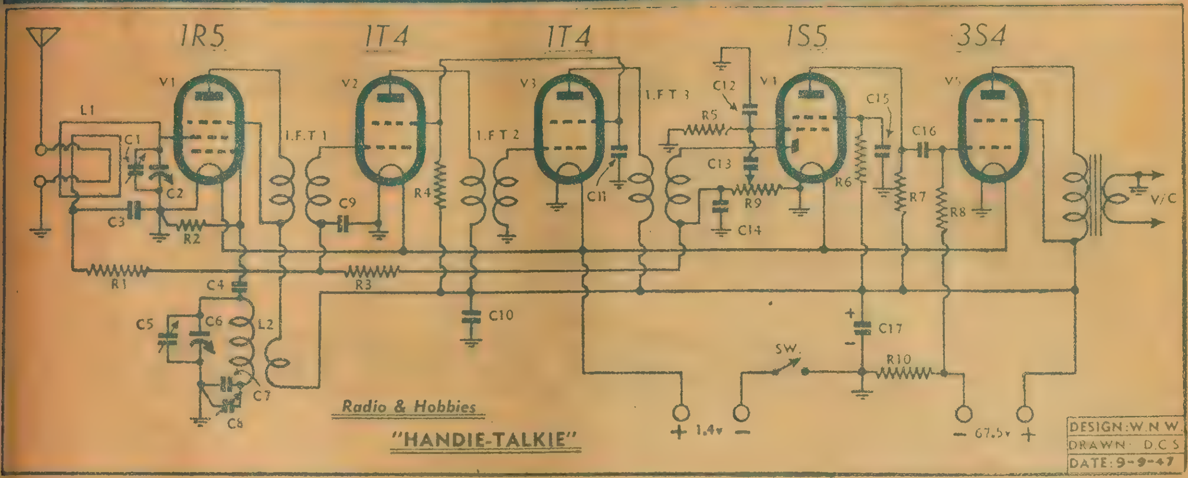


The R & H

Here is the set you've been wanting for years—a real baby personal portable—a regular 5-valve superhet, loop aerial and all, not much bigger than our pass-port! We have all spent many hours on its layout and production—we believe it is the only 5-valver of its kind available in Australia, and actually smaller than similar 4-valve sets. In the heart of our big city building, it will play all the locals at good strength. At night, particularly if you plug in an extra aerial, you'll hear all Australia. All the parts came from a regular radio store, and we have fixed the supply of chassis and cabinets. So you can build one just like it in time for your picnics, cricket matches, and summertime outings. Just push the battery switch and hear him go!

A FIVE VALVE "PERSONAL" YOU CAN MAKE



Handie-Talkie

The circuit as will be seen is particularly simple. There are no complexities—only a few points to watch in the layout when positioning the parts. The smaller the set, the more important it is to see that key components are mounted in the right place. The text will tell you all about it.

AS with most of our sets, the 1947 "Handie Talkie," as we have chosen o call it, has quite a personal background. We have naturally been aware f the keen reader interest in miniaure portables but had not been able o do much about it for lack of suitable omponents.

There was also some doubt in our nind as to whether miniature sets vere really a proposition for home construction. One can tolerate a few iberties when there is a square foot f chassis to spare, but it is a very lifferent matter when substantially he same number of components have o be fitted into a fraction of the space.

Our misgivings on this score were argely dispelled by the reception accorded "Tom Thumb" in the August ssue. Not at all worried by the miniaure parts and construction of this ittle regenerative set, many readers went right ahead and built it up exactly as we had described it.

Then a few other things began to happen. August brought to light the heaviest mail we have ever had to cope with, and a big proportion of the letters had some reference to the need for a new miniature portable.

SMALL PARTS

A local manufacturer came to light with a small two-gang condenser similar in dimensions to a couple we had seen from overseas. Small loop aerials made their appearance, and tiny oscillator coils. Imported miniaure IF transformers were seen on dealers' shelves, and there was talk of them being produced locally.

Then, to cap it all, limited stocks of the long-awaited button-based valves were released, with suitable sockets.

We could still see possible shortages, but the decision was inevitable. Shortages or no, we must have a new miniature portable.

PROJECT COMPLETED

By the time you read this you should be able to buy a new chassis and cabinet specially made for the job, together with a dial plate and knobs to match. A fortnight's work, plus midnight oil and aspirins, turned the idea into a completed set, photographs, article and all.

The photographs don't show the set to full advantage. The prototype cabinet was produced very hastily with hacksaw and file and photographed with the paint still "tacky." The dial plate is the right size and shape, but boasts only a few hand-painted figures instead of a properly printed scale. Even the knobs aren't the right shape, but the set has plenty of "oomph" just the same.

Quite a few trade identities have seen the set and their reaction has been the same. "It's a winner"—"Best thing you've ever turned out."

But enough of all that. Let's tell you about the works.

The circuit diagram is very much like any other battery set and gives little hint of the physical form it must take. You will note tha it uses a 1R5 converter, two 1T4 IF amplifier valves, a 1S5 diode-pentode and a 3S4 output valve.

The omission or otherwise of an RF stage is dictated very largely by the supply position of three-gang miniature condensers and the simple truth is that there are very few available. A tuned RF stage in a portable receiver is a very good thing, both for gain and signal-to-noise ratio, but it obviously could not be considered in the light of the parts position. And an untuned RF stage is of doubtful value.

So our resonant loop aerial feeds straight into the grid circuit of the 1R5 converter. We thought carefully about the idea of a tuned loop in relation to other methods. One idea is to have an untuned low impedance loop comprising two or three turns around the outside of the case. A neat scheme, but it does require a specially tapped aerial coil, which we had no time to organise. Another difficulty is that of camouflaging the wires wound around the outside of an otherwise finished cabinet.

STRAP AERIALS

Aerials in the carrying strap are another possibility. Here, again, special components are desirable and a long strap aerial is just as likely to be a nuisance as an asset. These schemes

The essential background to quality reproduction

PHILIPS MICROPHONES

DX communication is the Radio Amateurs' most popular enjoyment, and for certainty of voice identification at extreme distance the type of microphone is important. Emphasis of the higher speech frequencies is required to "cut through" during interference and conditions of selective fading. Too much reproduction of lower audio frequencies can result in difficulty of reception by that DX station. Philips microphones are designed to suit the special requirements of the transmitting Radio Amateur.

The microphones illustrated, and also type 9535R (a general purpose crystal microphone), are available *now* from the Philips Office in your State.

828. *A highly efficient, modern, streamlined, dynamic microphone, fitted with shielded plug and socket and supplied complete with 25 ft. of shield cable and stand . . . £8/11/6 (inc. tax) or without stand, £8.*

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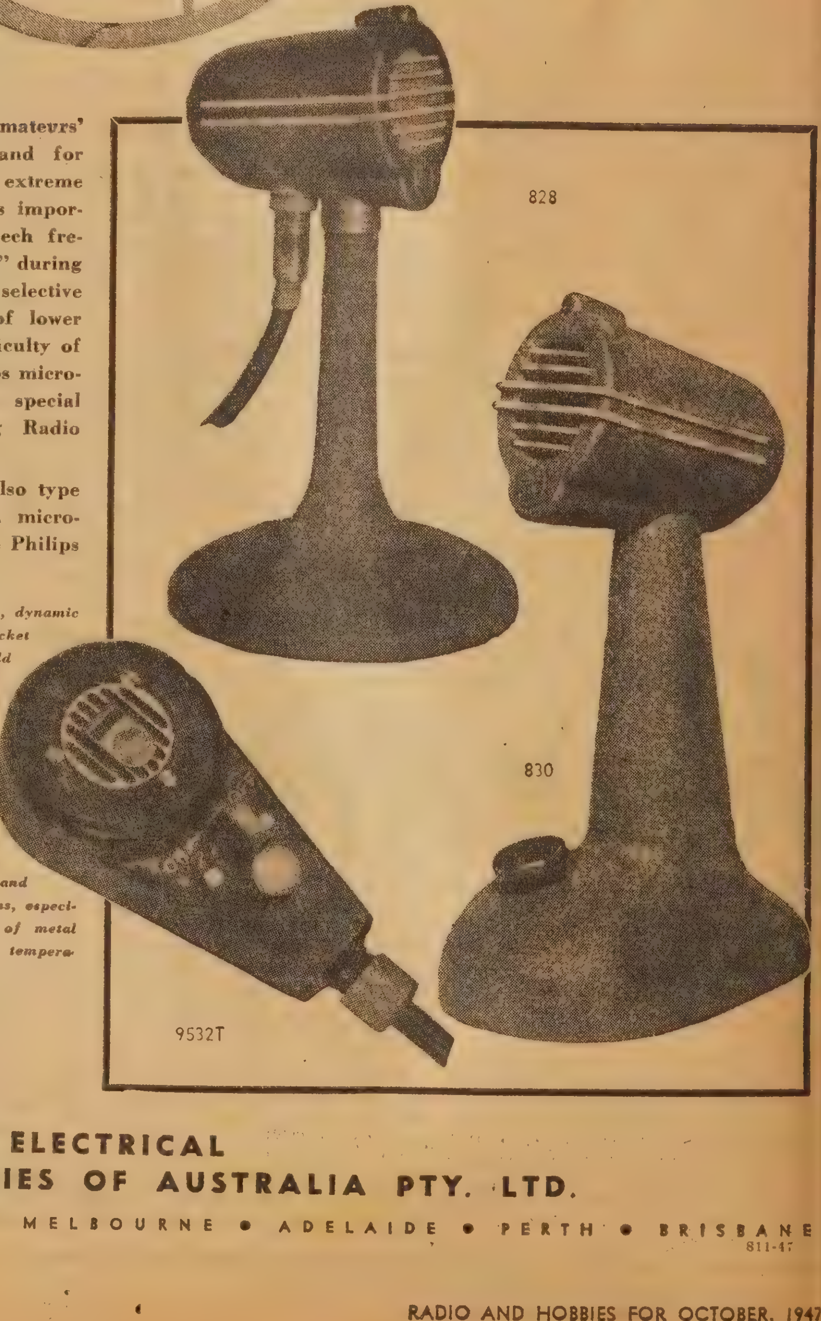
9532T. *An excellent general purpose hand microphone with a wide range of applications, especially for mobile work. The diaphragm is of metal construction, extremely rugged and free from temperature variations. Price, £10/18/6 (inc. tax).*



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were accordingly shelved for future reference and reliance placed on the well-proven tuned loop.

To ensure high gain in the set we elected to use two IF stages. These are operated with very low screen voltage, however, and actually draw only a fraction of the high tension current of a single stage operating under maximum conditions. There is an extra .05 amp of filament drain, of course, but this is not of vital importance.

A 1S5 operates as a diode detector and pentode audio amplifier, with a 3S4 as output valve.

In a circuit of this nature, the important thing is naturally to keep the number of components to an absolute minimum, since every additional part makes a call on the very restricted space under the chassis. Thus, the screen and oscillator plate of the 1R5 operates from the full high tension voltage, with a single 0.1 mfd high tension bypass. We tried a .01 mfd mica condenser in this position, but the effect was not quite adequate to suppress regeneration. Use a small 200-volt condenser or you will never fit it in beneath the chassis.

BACK BIAS

Back-bias is provided for the output valve to obviate the need for a C battery, and an electrolytic condenser becomes necessary to prevent a degenerative effect. We chose to use an 8 mfd condenser between B-plus and chassis, where it is also useful under conditions when the B-battery is very run down. We found that the set operated quite satisfactorily with a 67½-volt battery delivering less than 45 volts.

Once again, it is absolutely essential to use one of the new midget 8 mfd condensers which are now available, and to avoid any condenser of doubtful quality. The condenser is connected right across the high tension supply and can impose a harmful bleed on the B-battery. In the original set no initial drain could be detected through a 1.0 milliamp meter, so we had no apprehensions on that score.

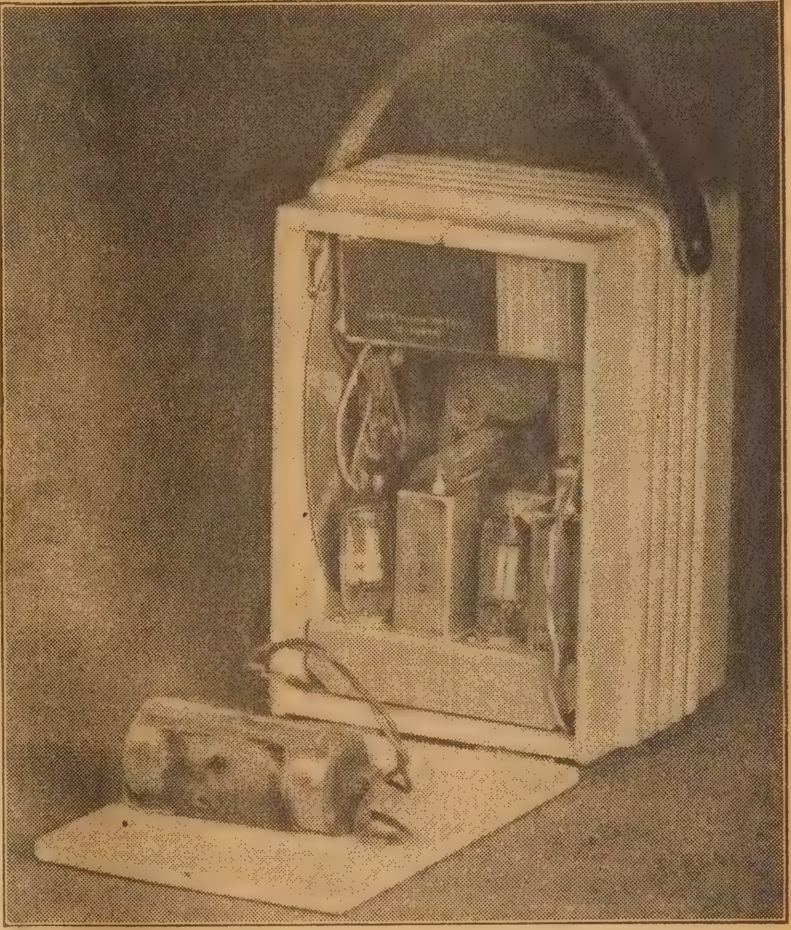
Even so, it is good practice to disconnect the B-battery during long periods of idleness to avoid any possible bleed current and to avoid having the high tension voltage permanently in circuit. The ideal would be a double pole switch, but we had no hopes of finding one small enough for the job.

THE CIRCUIT

A dropping resistor is necessary for the two IF amplifier screens, and an .01 mica condenser suffices for a bypass. AVC is applied to two stages only and the filter is cut to a minimum. A .05 mfd condenser is necessary in the loop aerial return, since a smaller value interferes with the tracking of the tuned circuit. Use a midget 200-volt tubular and it can be mounted above the chassis alongside the 1R5 converter valve.

A number of condensers and resistors is essential in the audio circuits, but these can all be midget types with the sole possible exception of the 10 meg-ohm grid resistor, R5. Use ¼-watt resistors in all other positions and use

THE SET INSIDE THE CABINET



The picture shows how the set and batteries fit into the cabinet. The "B" battery is in place, and the "A" battery is shown in its clip on the hinged back. There is room for quite a large "A" cell.

PARTS LIST

AND KEY TO CIRCUIT

1	Chassis 3 15/16" x 3¾" wide x 7/8" deep.
1	Cabinet 4 3/16" wide x 4" deep x 6 3/16" high (inside dim).
1	Loop aerial, 4" x 5" oval (approx.).
1	Midget 2-gang condeser.
3	Midget 455 kc. I.F. transformers.
1	Midget oscillator coil (wound on grid resistor).
1	3" loudspeaker (or smaller) with 5000 ohm trans.
1	3S4, 1 1R5, 1 1S5, 2 1T4 valves.
1	67½ volt miniature B battery.
1	1.5 volt cell (see text).
1	Dial indicator plate.
2	knobs.
1	Midget off-on switch.

SUNDRIES

Plastic hook-up wire. 1 & 2-mil. spaghetti, nuts, bolts, solder lugs, solder, scrap aluminium for brackets.

CONDENSERS

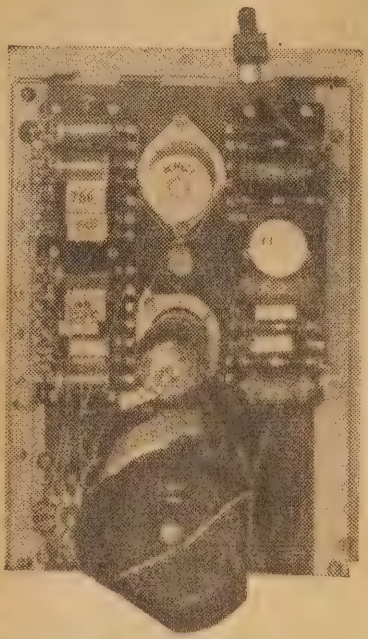
C1	2-plate mica trimmer.
C2	Section of gang, .0004 mfd. (approx.).
C4	.0001 mfd. midget mica.
C3	.05 mfd. 200 V. tubular.
C6	Section of gang, .0004 mfd. (approx.).
C7	.0004 mfd. mica.
C8	2-plate mica trimmer.
C9	.01 mfd. mica.
C10	0.1 mfd. 200 V. tubular.
C11	.01 mfd. mica.
C12	.00005 midget mica.
C13	.005 mfd. mica.
C14	.0001 mfd. midget mica.
C15	.01 mfd. mica.
C16	.005 mfd. mica.
C17	8 mfd. midget electrolytic.

RESISTORS

R1	0.1 meg. 1/3rd. W.
R2	0.1 meg. 1/3rd. W.
R3	3.0 meg. 1/3rd. W.
R4	.25 meg. 1/3rd. W.
R5	10 meg.
R6	3.0 meg. 1/3rd. W.
R7	1.0 meg. 1/3rd. W.
R8	3.0 meg. 1/3rd. W.
R9	1.0 meg. potentiometer (small).
R10	600 ohm midget.

ARMY

DISPOSALS EQUIPMENT



Internal View

WAVEMETERS

(Class C)

(Manufactured by A.W.A. For The Army)

These wavemeters are ideal for the amateur station. Regulations demand that every experimental station has, as a part of its equipment, a calibrated wavemeter.

Now is your chance to complete that station with a necessary instrument at a fraction of its original cost.

Each unit fully "tested" before being despatched to clients.

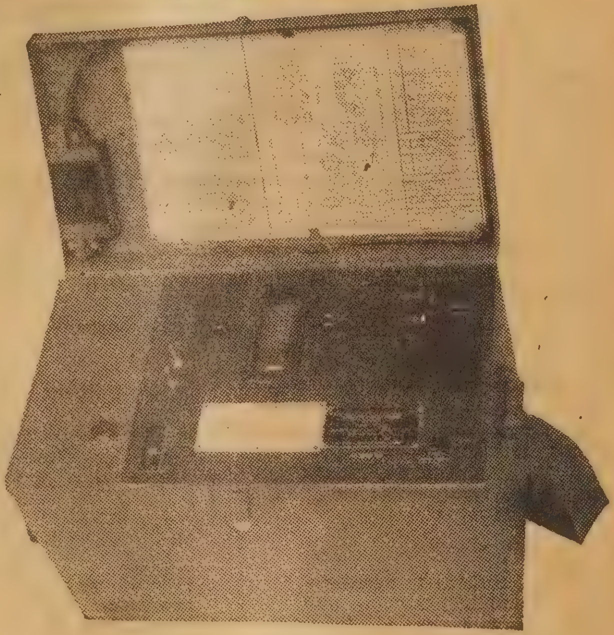
£4-17-6 F.O.R.

Range, 1470kc. to 10,260kc. In three bands as follows 1470 to 2870, 2800 to 5520 and 5280 to 10,260. Wavemeter operates on:—6 volts A.C. or D.C. L.T. for filament ot valve and 90 volts H.T. (no batteries supplied). Valve used 1-6J8.

Jack provided for use with headphones when used for checking transmitter.

Circuit diagram, parts list, working instructions, headphones, etc. Supplied with each wavemeter.

Weight 23 lb. Size 15¼" x 10¼" x 8¼"



External View

PARAGON RADIO

245 PARRAMATTA RD.,
HABERFIELD, N.S.W.

Phone: UA2145

ADDRESS ALL MAIL TO:—
BOX 14 P.O., HABERFIELD,
N.S.W.

s many of the midget "postage-stamp" iica condensers as possible. Every aving in component size will help mplify layout and wiring.

As far as the constructor is concerned, more attention needs to be aid the actual job of assembling and iring the set than to the details of ne electrical circuit. Apart from its iminutive size, the chassis uses a more r less conventional layout—a point e considered worth while in this ioneer" midget portable.

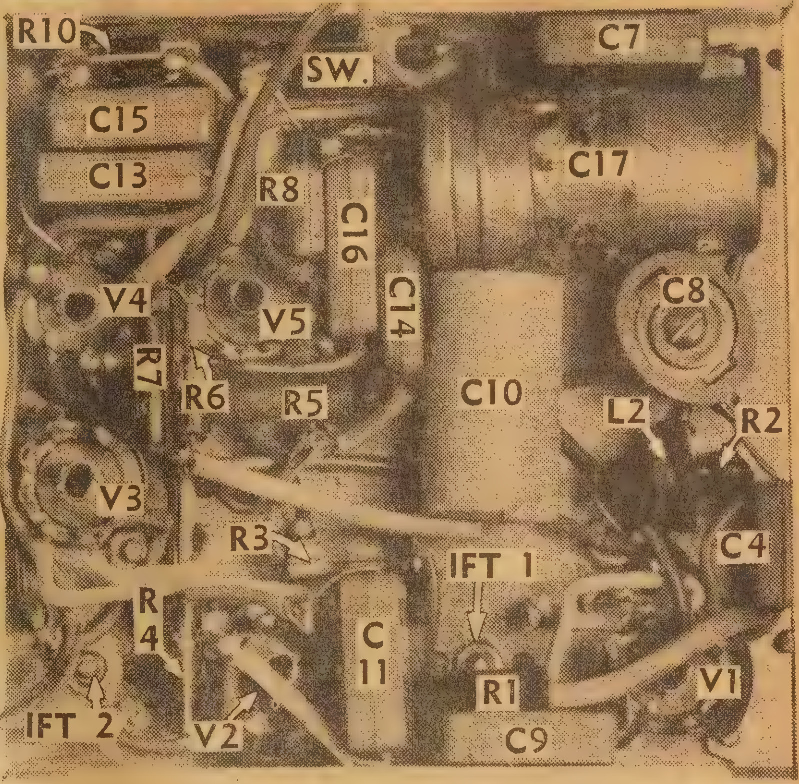
IMENSIONS CRITICAL

The chassis is actually 3 15-16in. ng, 3¾in. wide and 7-8in. deep. These imensions are quite critical, and anying over a sixteenth inch tolerance ay make the difference between the arts fitting together and into the abinet or the reverse. Even assuming at you use a commercial chassis and abinet, it is essential to plan ahead nd make sure that everything will fit xactly as intended.

The original set used a "Kingsley" ang, being the smallest of the locally ade air-gangs we knew of. As a ile we avoid direct mention of trade ames, but there is no alternative in a t of this type, where parts must fit xactly together. Mounting the gang -8in. back from the front of the hassis and 1-32in. from the side brings ne spindle 1 1-16in. above the top of ne chassis and 1 5-16in. in from the ght-hand edge. This sets the position of the tuning control on the front the cabinet.

There are one or two excellent Eng-

PARTS POSITION UNDER CHASSIS



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£8/-/-

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6v.	190v. 90MA.	3	10	0
12v.	180v. 60MA.	3	0	0
12v.	275v. 110 550v. 50	3	10	0
24v.	550v. 350	6	0	0

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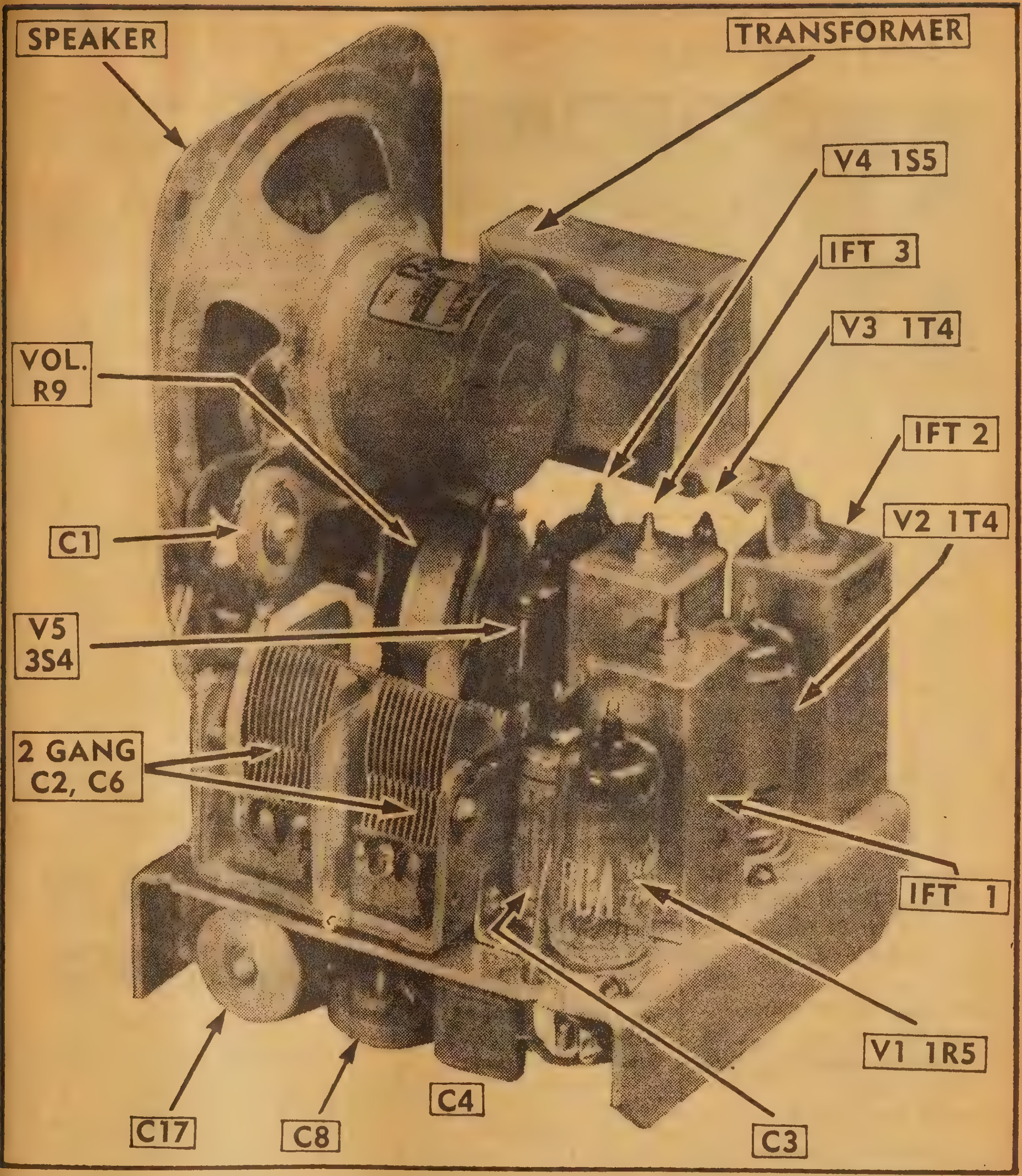

lish gangs on the market which can be used successfully in the set. These must be mounted on suitable brackets to bring the gang spindle in exactly the same relationship to the front and side of the chassis.

The brackets themselves will have to be cut and bent from a scrap of aluminium—not too difficult a task for anyone who proposes to build this set.

DIRECT DRIVE

We have made no attempt to provide for a vernier tuning drive because of the space factor. In practice, tuning with a direct knob control is quite satisfactory.

The volume control must be mounted on another bracket to bring the spindle exactly in line horizontally with the gang spindle—that is 1 1-16in. above the top of the chassis. The distance between spindles must be 1 5-8in., bringing the volume control spindle 1 5-16in. from the left-hand edge of the chassis. The volume control and bracket should be mounted far enough back to allow just the ¼in. spindle to protrude through the front of the cabinet — not the threaded bush as well.

It will pay to be fussy about these dimensions, since the spindles must coincide with the holes in the new escutcheon plate being produced for the set. If they are not exactly right the holes will not coincide and the plate may not mount in correct relationship to the sides of the cabinet or the speaker grille.

POSITION OF KNOBS

The knobs are not spaced symmetrically on the plate but a balanced appearance is lent by the plate itself and the numerical reference scale surrounding the tuning knob. Another point, of course, is that the positions are set to some extent by the natural location of the units on the chassis and the minimum clearance between them when the gang rotors are in the open position.

The "off-on" switch was not included with the volume control, since we could not locate a combined unit of suitable small dimensions. Rather

PEANUT VALVES

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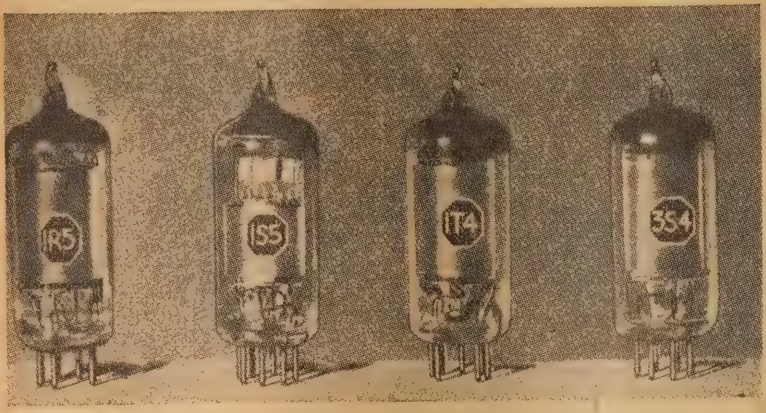

IR5 Converter	IS5 Diode Pentode	IT4 R.F. Pentode	3S4 Power Pentode
22/10 ea.	21/10 ea.	22/4 ea.	22/10 ea.

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Osc. Coil	8/6
R.F. Coil	8/6
I.F. Transformers	13/9
3 Gang Condensers	22/-
DA7 Dial	9/-
Trimmers	1/-
Condensers: 10 mfd 2/6; .5 2/1; .1 1/-; .05 9d; .01 9d; .001 9d; .0001 9d; .00025 9d.	
Padders	2/6
.5 Potentiometer with switch	8/6
½ watt Resistors, IRC	9d
3" Per. Mag. Speakers	22/6
Valves, see above	
Batteries, see column 3.	

LITTLE GENERAL

PARTS PRICE LIST

Cabinets leatherette covered	29/6
Chassis	4/11
2 Gang Condensers	17/-
DA7 Tuning Dial	9/-
Power Transformer, 325v.	19/7
Small Filter Choke	5/9
Aerial Coil	8/6
Oscill. Coil	8/6
Intermediates, 465 kc	13/9
Padder	2/6
Trimmers	1/-
Resistors: 1meg. 9d; .5meg. 9d; .05 9d; 20000 9d; 1000 9d; 400 ohm 1/2; 150 ohm 1/2.	
Potentiometer, 5000 ohm	5/-
8mfd. Electrolytics	3/9
Condensers: .5 2/1; .1 1/-; .002 9d; .0001 9d; .0005 9d.	
Octal Sockets	1/-
Speaker, 5" per. mag., 5000 ohms	28/6
Valves: 6J8 21/4; 6G8 19/10; 6V6 18/10; 6X5 20/10.	

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TOM THUMB

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Front Panel, Chassis and Valve Bracket, set	3/6
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Midget Tuning Condensers .00036	12/6
Resistors, ½ watt, IRC	9d
Condensers: 10 mfd. 2/6; .01 9d; .00025 9d; .0001 9d.	
Valves, see next column	
Headphones, 4000 ohm, English	32/6
Dial Plate	1/3
Knobs 9d, Pin Jacks 6d, Pointer Knob 1/-, Batteries, see below.	

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NEW STANDARD RADIO

102 HUNTER ST. NEWCASTLE.

than compromise an otherwise nice layout on this account we used a particularly neat little push-button switch which happens to be available just now from distributors.

The 3in. loudspeaker mounts centrally above the tuning gang and potentiometer, the cone housing clearing the spindles by just 1-8in. This brings the magnet assembly to such a height that the "Minimax" battery just pushes in snugly between the magnet and the top of the cabinet. The front of the speaker should be lined up flush with the front edge of the chassis.

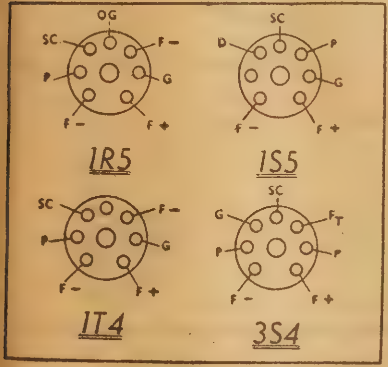
Yes, we know 3in. loudspeakers are as scarce as hen's teeth at the moment, but the position is bound to improve in the not-too-distant future!

You will have to manufacture a little bracket to attach the bottom right-hand edge of the speaker housing to the frame of the gang condenser. The other side of the speaker is attached to an extension of the same bracket which mounts the volume control.

OUTPUT TRANSFORMER

The midget output transformer must also be mounted by one lug to this bracket, at such a height that the top of the transformer is level with the magnet assembly. The B battery slides in on top of these two components and requires no other support. Careful control of vertical height is obviously essential.

Just how you bend the volume control bracket, or what fitments you employ to mount the loudspeaker and transformer is not very important, provided they are in exactly the right positions. You will note, by the way, that there is just room for the transformer to mount alongside the speaker magnet without fouling the side of the cabinet. The rear of the transformer can be anchored by a bracket under a locknut of the second IF transformer.



Here are the underneath socket connections for the valves used in the set. Note that three of them have two F— connections, both of which can be earthed. For the 3S4 connections see text.

WATCH DETAILS

All this detail may seem rather laborious, but precision is essential in a small job like this. And it is only the beginning. We can already foresee still more compact designs requiring almost watchmaker's technique in the construction.

Once this part of the job is done, the rest of the assembly is quite simple. If the chassis is ready punched, it should be the work of a few minutes to mount the valve sockets and IF transformers.

The IF transformers in the original set are of English manufacture and employ single-hole mounting. The proposed locally-made units will be similar in size but have a modified mounting arrangement. It will simplify matters to use smaller nuts and screws than the usual 1-8in. Whitworth, and 8BA is suggested—if you can acquire them.

Be sure to mount the valve sockets and IF transformers in a way to ensure direct plate and grid leads. This is important to ensure compact wiring and to avoid unwanted feedback.

Before beginning the job or wiring, file the bit of the soldering iron to a slender taper and then file the corners to reduce it to a slightly flattened diamond point. Tin it carefully and keep the tip clean as an absolute essential to neat soldering. You will be working on socket lugs which are less than an eighth-inch apart, and with midget condensers and resistors.

Excess heat or flux on any of these components may damage them, likewise unnecessary bending of the leads.

Begin by wiring up the filaments of the five valves, using preferably two colors of hook-up. The negative filament string must be connected to chassis, so that all A-minus pins become handy earth points. Remember, also, to connect the centre metal

(Continued on Page 75)

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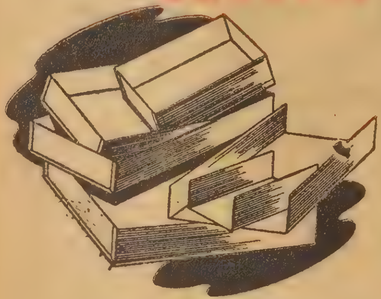

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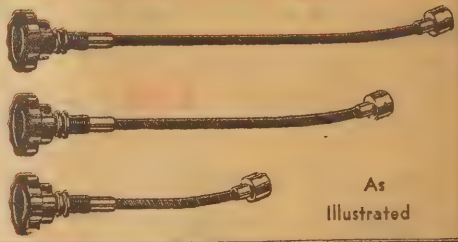

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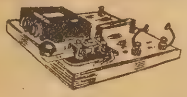

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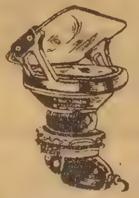

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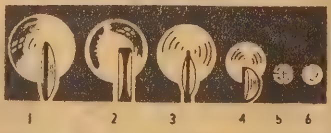

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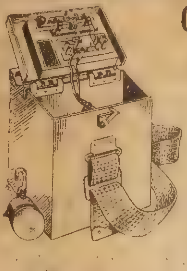

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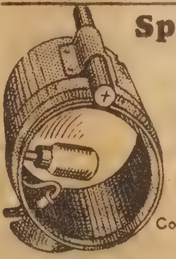

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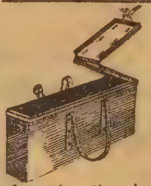

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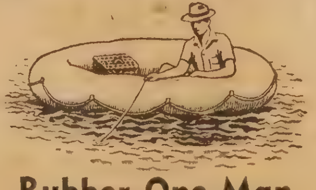

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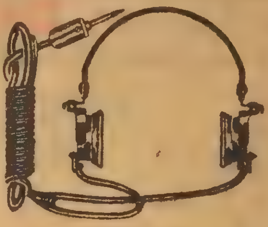

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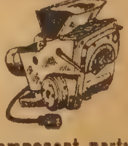

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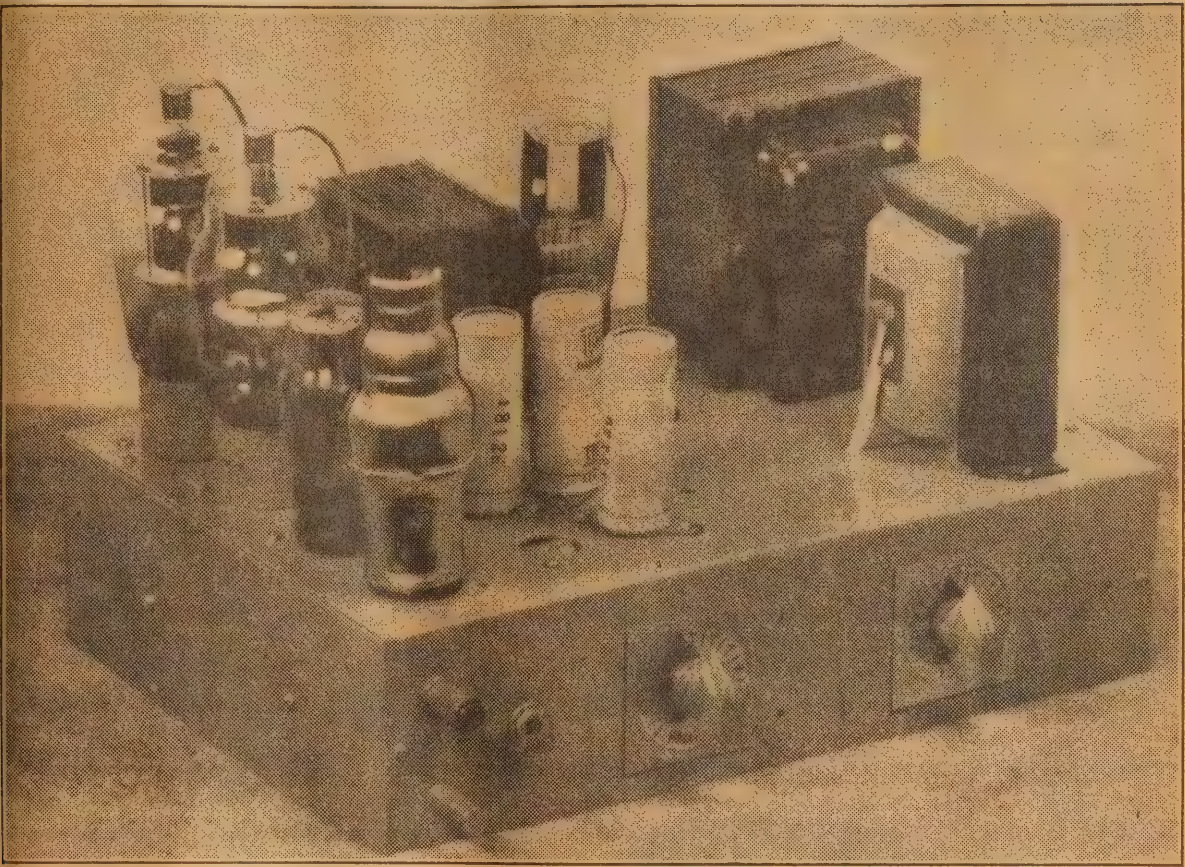
A NEW 20-WATT AMPLIFIER DESIGN



This general view of the amplifier will help you with the layout. It is not particularly critical.

The immediate success of our big 807 Radiogram prompted us to build up this amplifier for those who are interested mainly in quality reproduction or gramophone recordings. With an output of over 20 watts, you can regard this amplifier as the logical successor to the 13 watt 6V6 job, so popular over the past few years.

by *W. N. Williams*

THE original 13-watt amplifier proved popular because it offered xcellent fidelity and good power out- ut for a very moderate cost. Thous- nds of them were built in the original orm, and as many others with tuners nd preamplifier stages. Our new 807 ob costs no more to build, but gives ractically double the power output.

Behind this last sentence is the re- ase of 807 transmitting valves at a raction of their original price, so that hey cost even less than the 6V6-G alves they replace. A much higher perating voltage is permissible, and is can be obtained from the same pe of power supply without compli- tion.

ERMAG. SPEAKERS

Since the original 13-watt job was scribed, permagnetic speakers have me into general use in place of elec- odynamics, which require a hundred lts or so across the field coil. In is new amplifier the full available voltage is applied to the plates of the output valves instead of being partly absorbed by the field coil. Hence the higher output without much apparent change to the power supply.

The first valve in the circuit is a 6J7-G pentode voltage amplifier, connected in conventional fashion. Actually you can use a 57, 6C6, 6SJ7, or any similar sharp cut-off RF pentode without change to the electrical circuit. The 6AC7, VR65 or EF50 are other possibilities, although we have not actually tried them out in this circuit. You will note a rather strange collection of parts around the screen of the valve, the purpose of which will be explained a little later.

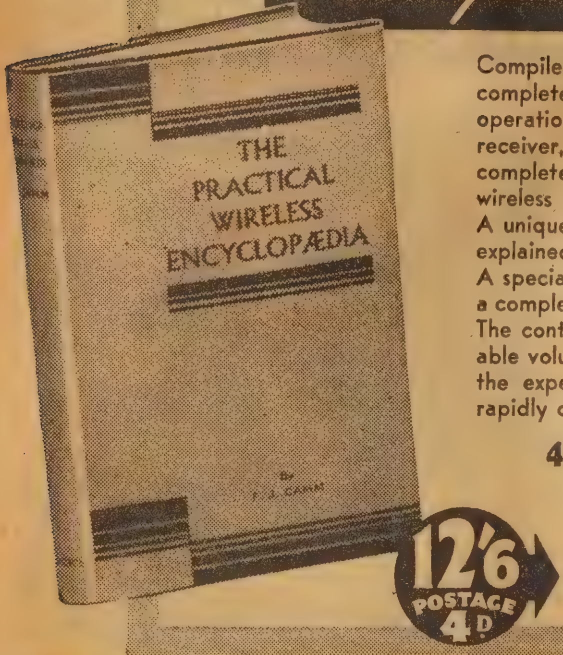
We may mention in passing that the 6U7-G, 6K7-G, or other similar variable-mu pentodes are not a good choice for this position, where the stage is called upon to handle a substantial signal voltage. The tapering grid characteristic of a variable-mu valve can cause severe harmonic distortion.

THE PHASE-CHANGER

The second valve in the amplifier is a triode-connected 6J7-G, which serves as a phase-splitter. Once again, almost any of the sharp cut-off pentodes will serve in this position, if connected as a triode.

We actually used an ordinary 6J5-G triode, which is seen in the photographs. Readers may have one of these or some other general purpose triode on hand, which will serve equally well with the same component values. A straight triode was not

Everyman's Guide to Radio



Compiled by an acknowledged expert, this volume forms a complete guide, in alphabetical order, to the construction, operation, repair and principles of every type of wireless receiver, including definitions, explanations, formulae and complete instructions on the making and testing of various wireless components.
A unique volume with every technical term, formula and fact explained in language which even the beginner will understand. A special feature of the work is the illustrations, which include a complete series of circuits for every type of modern receiver. The contents include every modern development. An invaluable volume which is a treasury of knowledge to the beginner, the expert, and the ordinary listener. Every fact may be rapidly consulted.

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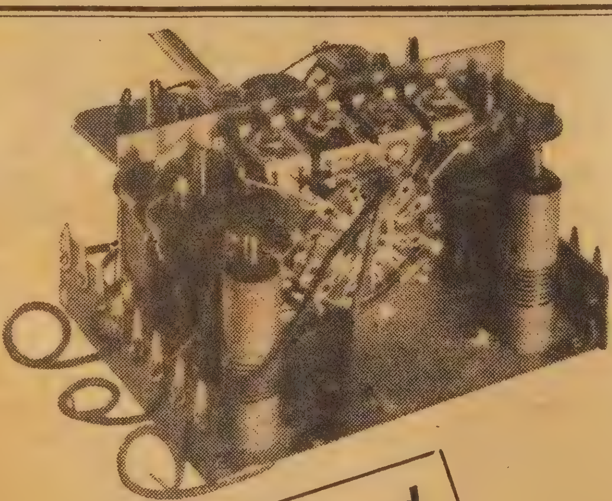

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tipulated in the circuit, mainly beause there is no suitable type in the ocally-made range.

Another point, of course, is that a J7-G is the better valve to buy if new tube is necessary for the position. t makes an excellent triode, but has vider possible applications if the quipment is ever rebuilt at a later late.

In planning the amplifier, we were empted to use the phase inverter arangement adopted for the "Vibraram" receiver a couple of months ack. Perhaps it was just the urge o be different, for once.

However, there are a couple of oints which make this circuit less esirable than the phase-splitter with 07 output valves. The first is that he grid resistors for the 807's should e as low as possible, consistent with ircuit requirements, and we wanted o use 0.25 meg. at the most. This onstitutes rather a severe a-c load n the plate circuit of the voltage mplifier, unless the plate load resistor e reduced to 0.1 megohm.

GRID CIRCUIT

This, in turn, would have a marked ffect on the gain of the voltage mplifier, limiting the amount of feedack which can be applied or, alternaively, rendering the amplifier insensiive. As it is, the amplifier will give ull output with any ordinary pickup r radio tuner. It is not intended or direct use with a microphone.

A further small point is that any grid urrent through either 807 would tend o bias the pentode phase inverter and ave an adverse effect on its operaion.

With the phase-splitter, the plate nd cathode loads can conveniently e kept down to .05 megohm, so that he low grid circuit resistance is no mbarrassment. And, furthermore, the ircuit allows one to use any odd iode which may happen to be on and, instead of demanding the use a second pentode voltage amplifier.

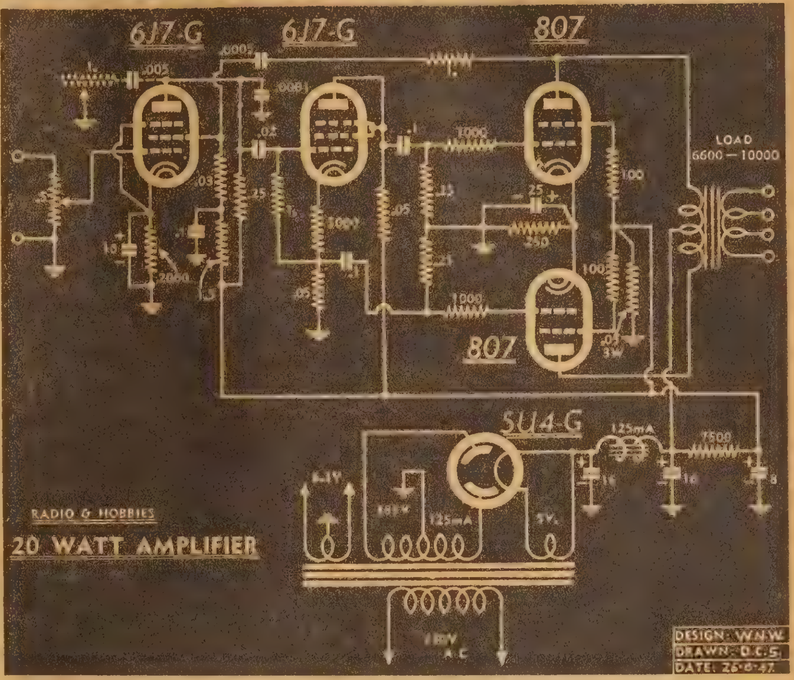
As in the big radiogram receiver, he 807 valves are operated under class B1 conditions with about 400 volts on he plates, 270 odd volts on the screens nd cathode bias. Under ideal condiions, one could expect a power outut of better than 25 watts, but some ss occurs due to poor voltage regulaion and the imperfections of the utput transformer. Even so, we easured better than 20 watts before verload point, which is more than nough for any domestic requirement. Hence, our reference to the job as a 0-watt amplifier.

UPPRESSORS

Grid and screen suppressor resistors re included in the circuit as a preaution against instability, and these hould be mounted as close as posble to the pins of the valve.

The screens are supplied through a 500 ohm dropping resistor and byassed to earth by an 8 mfd. electrotic. The 50,000 ohm 3-watt resistor nd the drain of the two 6J7-G alves helps to stabilise the screen oltage to some extent. Naturally, the ropping resistor and the electrolytic ondenser form a decoupling network, hich adds to the filtering.

CIRCUIT OF THE NEW AMPLIFIER



After considerable experiment, we have come back to the old phase-changer, always reliable.

Our experience with 807 valves under these general conditions is that the load is not particularly critical, provided it is between about 6500 and 10,000 ohms plate-to-plate. But do not use anything outside these limits. To handle the output it is very wise to use something larger than the transformers normally fitted to loudspeakers. Not only is the core inadequate, but the efficiency is generally well down.

We used a standard commercial output transformer, which is readily available. It is nominally rated at 15 watts and affords a choice of three secondary impedances for different loudspeakers, namely 2.3, 8.0, and 12 ohms.

SCREEN FEED

Negative feedback is taken from the plate of the upper output valve, through a resistor and a small condenser to the screen of the 6J7-G voltage amplifier. The small condenser tends to reduce the feedback at the very low frequencies and thereby gives a small amount of bass boost. The effective degree of feedback is set by the .03 megohm resistor, which is in series with the normal 0.1 mfd. screen bypass.

The 1.5 megohm d-c supply resistor

PARTS LIST

1 Chassis 12 x 8½ x 3in.

1 Power Transformer 385/0/385V., 125mA, 5V 2A, 6.3V 3A.

1 Filter Choke 125mA.

1 Valve Shield.

3 Octal Sockets.

3 5-pin Sockets.

2 Terminals.

1 Output transformer 6600 to 10,000 ohm C.T. primary. Secondary to suit loudspeaker.

2 Indicator plates, "Volume" and "Tone."

RESISTORS

1 1.5 meg., 1 1.0 meg., 3 .25 meg., 2 .05 meg.,

1 .05 meg. (3W or substitute), 1 .03 meg., 1 7500 ohm 5W., 1 5000 ohm, 1 2000 ohm, 2 1000 ohm, 1 250 ohm 5W., 2 100 ohm, 1 1.0 meg. potentiometer, 1 0.5 meg. potentiometer.

CONDENSERS

2 16 mfd. 600 P.V., 1 8 mfd. 525 P.V., 1 25 mfd. 40 P.V., 1 10 mfd., 40 P.V., 3 0.1 mfd. tub., 1 .02 mfd. tub., 1 .005 mfd. mica, 1 .0005 mfd. mica, 1 .0001 mfd. mica.

VALVES

6J7-G, 6J7-G (or gen. purp. triode), 807, 807, 5U4-G.

SPEAKER

12-inch permagnetic.

SUNDRIES:

2 insulated grid clips, 2 small grid clips, power flex, hook-up wire, shielded wire, spaghetti, nuts and bolts, solder lugs, 2 pointer knobs.

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OP22.	Single 807. 3250 ohms. 85 m.a. D.C.	500/125 ohms or 2.3 ohms.	1 db. 50 c/s-12,000 c/s.	10W.
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Type **OP22** is ideally suited for the Recording Amplifier described in last month's issue.

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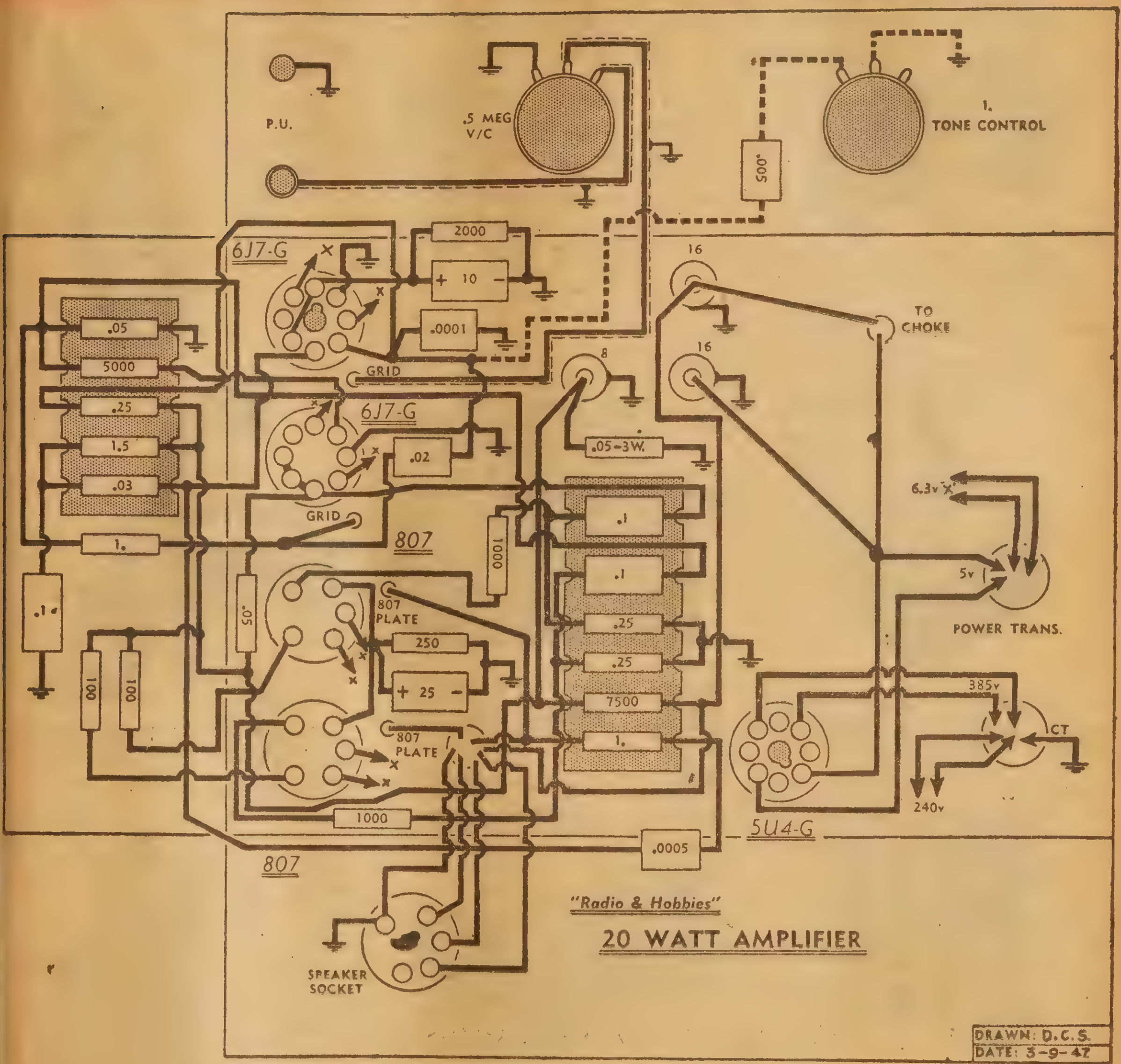
WIRING DIAGRAM OF THE 20-WATT AMPLIFIER



This diagram shows how we laid out our chassis and wiring.

to the screen feeds into this point, since the series condenser prevents the d-c supply being derived from the negative feedback network. The arrangement may look a little involved, but the immediate reaction of everyone who has heard the original 807 radiogram is to comment on the full, throbbing quality of the bass response.

Incidentally, we have modified slightly the characteristics of the feedback and bass boost network, but the difference is only minor. In this amplifier, the emphasis is a little lower down the scale.

A final point is that we have shown dotted a conventional treble-cut tone control. This device should not be necessary, but readers frequently ask for it, as much as anything from habit. As far as we were concerned, its chief virtue was to balance the layout of controls on the front of the chassis.

Coming to the power supply, it is a perfectly conventional affair using a 125 milliamp power transformer and choke, with three filter condensers. You could just get by with 100 milliamp equipment, but the 125 milliamp rating gives a margin of safety. A 150 milliamp rating throughout would be a good investment against possible additions to the amplifier, but there is not too much space to spare on the chassis.

Try and obtain 600 volt electrolytc condensers for use either side of the choke, as the 525 volt units would be operating right on the peak of their ratings. At least make the one adjacent to the rectifier a 600-volt type. For the sake of low hum level, we have suggested 16 mfd condensers rather than 8 mfd units. Of course, the actual working inductance of the filter choke is a governing factor in the hum level.

In building up the amplifier, we used the same universal chassis as designed for the "Vox Major" amplifier, described a few months back. In fact, the original "Vox Major" was partly stripped and the extra components added. You will notice a jack in series with the input circuit. Just forget this, as it has no connection with the operation of the amplifier.

The two normal input terminals are to the left of the chassis one being earthed and the other feeding through a shielded lead to the "hot" side of the potentiometer. The centre of the

(Continued on Page 43)

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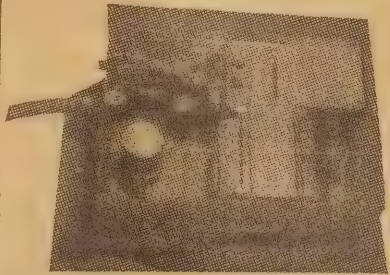

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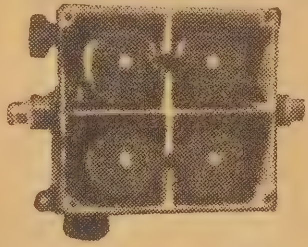

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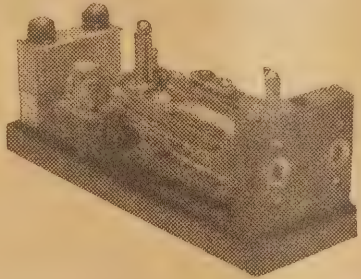

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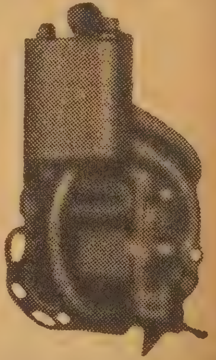

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POINTERS ON AERIAL SYSTEMS

WHILE the average urban dweller has come to think of an aerial simply as a length of wire tacked to the picture rail, there are plenty of instances where more attention has to be paid to the problem.

For general reception requirements, the conventional inverted "L" aerial is about the best all-round choice. This simply consists of a length of wire strung horizontally between poles and as high as possible, with a lead-in coming off one end, down to the receiver.

In remote areas, the horizontal portion of the aerial can be quite long, and constructors of small receivers frequently use as much as 100 feet of aerial wire, exclusive of the lead-in. However, such long aerials limit the apparent selectivity of small receivers and, in less remote areas, generally better results may often be obtained by keeping the aerial length down to about 50 feet.

The aerial should be as high as possible and erected clear of buildings. The directional properties of the inverted "L" are seldom very marked, so that it can be erected in any convenient position and direction.

Battery powered receivers should always be provided with an earth connection, made by clamping a wire round a pipe driven deeply into moist ground. An earth is less important with mains-operated receivers, mainly because a partial earth is provided by the power mains. However, where interference is experienced, the use of an effective earth may give quieter reception conditions, even though not adding materially to the loudness of the incoming signal.

Dipole aerials or special arrays are widely used for short-wave communication purposes, being cut and erected to give definite directional properties and high-gain at their natural resonant frequency.

But these very properties render them less suitable for general reception, where desired signals may arrive from all directions and at frequencies anywhere within the tuning range of the receiver.

However, the dipole aerial has another property which sometimes makes it useful in areas where electrical interference is high — notably close to power lines or industrial machines. Whereas the ordinary aerial and lead-in picks up signal over its entire length, the twin leads from a dipole are insensitive to incoming signals and merely convey the signal picked up in the top section to the aerial coil of the set.

Hence an improvement in signal-to-noise can sometimes be achieved by erecting the aerial proper as high as possible and remote from the source of interference, running the twin leads to the receiver arial coil. For broadcast reception, no use can be made of resonant effects, and the aerial can therefore be cut to any convenient length.

To be fully effective, the twin leads must connect to the respective ends of the aerial coil primary. This will normally require the lower end to be disconnected from chassis and returned to a second aerial terminal.

Many new insecticides, germicides and fumigants have names composed of initials such as DDT; they are confusing but much simpler to the layman than their long and complicated chemical names.

WIRING DIAGRAM OF THE 20-WATT AMPLIFIER

(Continued from Page 41)

potentiometer is connected by a second shielded lead, up through the chassis, to the grid cap of the first 6J7-G audio amplifier.

The audio amplifier valve is in the front left corner, with the phase splitter and the two 807 valves in line behind it. The plate leads of the 807 valves pass down through the chassis to the underside of the output transformer, mounted alongside them. When wiring up these valves, make sure to take the feedback from the correct plate. Another point: It is wise to fit these with insulated plate caps to prevent accidental contact with the 400 volts of high tension supply.

We took a couple of heater leads and the high tension to a socket at the rear of the chassis to facilitate possible use of the amplifier with a preamplifier stage or a tone control valve. Please yourself about this point.

Take the voice coil leads to the rear speaker socket, lock a couple of suitable indicator plates behind the control knobs and your amplifier will have quite a pleasing appearance.

Use it with a crystal pickup, as a general preference, and operate into nothing less than a well baffled 12-inch loudspeaker.

The rest of the story, if any, is told by the diagrams and the pictures. Unless we miss our guess, this amplifier will prove just as popular as the 807 Radiogram from which it came. Thanks again, Mr. Hitler, for the cheap 807's!

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1in. dia. with flat top .. .. ..
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Best quality silver plat Chassis Socket and Pl

5/-

Right angle adapter 2

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v impedance, double 'phones, com-
e with head band cord and
g. 7/6
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one, with head band, but less
d. **2/6**
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60 feet coils only.

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Home Recording

Here is a general article on disc recording, written especially for experimenters who have had no experience in this line. The article deliberately avoids intricate technicalities and reference to expensive equipment, but does give a good idea of what can be expected and achieved with home-made gear.

THERE is an old saying which suggests that "we haven't much money, but we have an awful lot of fun." Whatever circumstances the originator had in mind, the saying fits particularly well the approach of the hobbyist to home recording.

Next month we will probably publish a further article on this general subject contributed by a reader who has operated his own commercial studio. His contention is simply that, if you want to make good recordings from the outset you forgo any thoughts of a new car and put the money instead into a commercial recorder and a good microphone and then proceed to build —or have built—the best amplifier and studio you can manage, with all "mod. cons."

DIFFERENT APPROACH

And what we have to say in this article is not deliberately at variance with that idea. In a commercial venture your discs must be consistently good, and there is no room for explanations and repeat performances. And that means quality in studio and its appointments, in the microphone, the recorder, the amplifier, the discs, in fact, in everything through to the cue lights and stop watch.

For the home experimentar of course, such equipment can never be more than a pipe dream. Everything has to be scaled down to conform to his pocket, or its contents. He may turn out an excellent disc, but more often has to be satisfied with something that plays back a resonable image of the original sound. But what of it, if he has learned something new and the rest of the family are suitably intrigued and entertained?

ABOUT DISCS

But enough of the preamble. Let us see what is involved in this business of disc recording.

Your medium, of course, is the discs which are variously known as acetates or playbacks or blanks. They can be bought commercially in approximate 8, 10, 12 and 16 inch diameters, and in varying grades. The hobbyist can usually forget the 16-inch discs, which are used widely for commercial slow-speed recordings and play for about 15 minutes. The smaller discs have an ordinary playing time at 78 rpm of about 2, 3 and 4 minutes per side. They cost a little more than ordinary commercial records of similar size, so that it becomes an expensive business to spoil too many discs during the course of one's experiments.

The ordinary commercial recording is referred to as a shellac pressing, and is essentially a hard moulded copy of the original. You can play it with a heavy pickup, with oddly shaped needles, and handle it quite roughly without rendering it unplayable. Not that one should treat discs that way, but manufacturers have tried to make them just as tough as possible, consistent with other requirements.

But your playback disc is a very different animal. It has to be soft enough for the cutter to scribe a clean groove without chipping or blunting half-way through the operation. And because it has to be manufactured with that requirement in mind, it cannot withstand subsequent playing with a heavy pickup or a mis-shapen needle. But more of that anon.

Playback discs have a centre layer, which may be of cardboard, steel, aluminium or glass, coated on both sides with a thin layer (.006 to .01in.), of a plasticised resin or lacquer. With the return to normal conditions, most discs now have aluminium centres and a coating which is sprayed and spun to give the smoothest possible surface, which will cut cleanly without a tendency to chip or tear.

To be satisfactory, a disc must be flat. If not, the cutting head will tend to dig deeper into the material going up-hill, and conversely to cut a very shallow track when the record surface is receding from the stylus point. Records generally show minor imperfections in this respect, but obviously warped discs are to be avoided.

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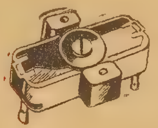
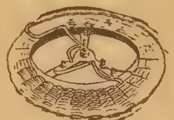
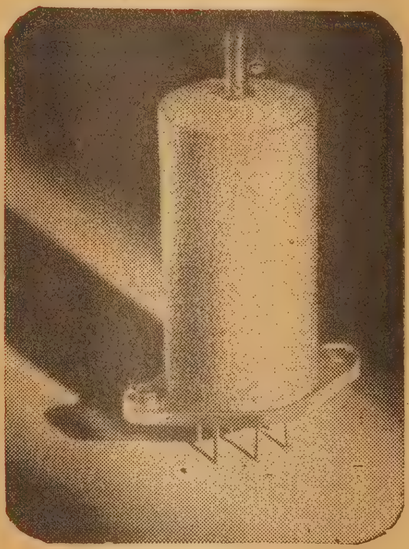
AT Right—1 Padding Condenser Type P21



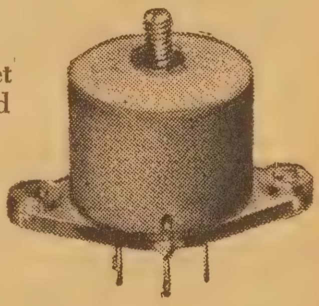
2 Miniature Intermediate Transformers Type IF168 (not illustrated).

At right—1 Loop Aerial, Type F125.



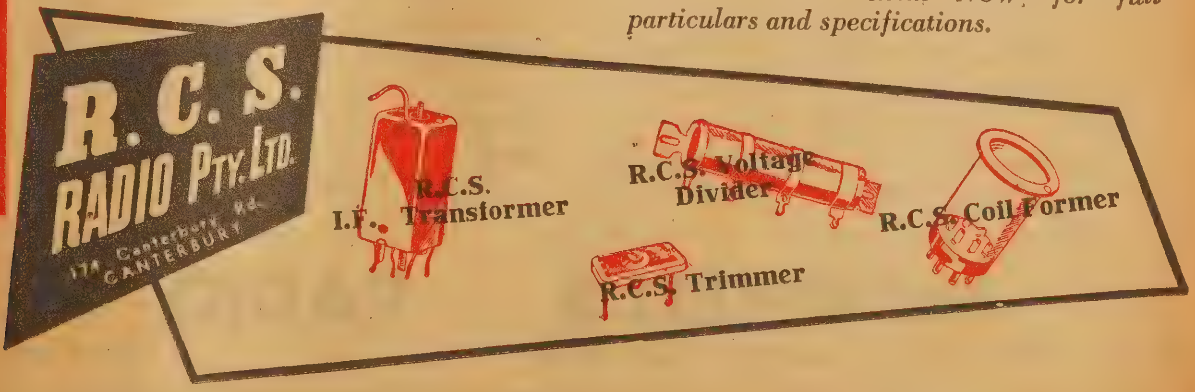


At right — Midget coil (reproduced actual size).



At left—Iron clad R.C.S. Magnasonic Coil.

These kits are available from your local retailer. Contact them NOW for full particulars and specifications.



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3¼"

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DIAL
Calibrated
Brand New
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Meter Assemblies
For Above
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It is possible to get a good idea of flatness by holding a disc so that it reflects the pattern from a steel frame window or a suitably ruled and illuminated card. A wavy image indicates that the surface is uneven.

Discs with cardboard centres are generally the worst offenders in this regard, the centre tending to warp appreciably. A further effect is that the surface is often pitted with tiny ripples caused by the texture and the absorption of the cardboard base. We have had little success with such discs, the groove depth tending to vary and the noise level to be very high.

AGE AND TEXTURE

The age and texture of the coating is a controlling factor in the ultimate quality of a disc. If the disc is freshly sprayed just before use the coating may still contain a proportion of solvent which renders it unduly soft. The cutter will dig deeply into the material and the higher frequencies may not record well, owing to the resilience of the surface. Distortion and noise may become apparent later as the track is warped by the drying-out process.

An old disc, on the other hand, may be harder than normal, resulting in a shallow track for the same stylus pressure. And, unless the stylus is very keen and adjusted correctly, the coating will tend to chip and tear, with a resultant increase in noise level.

The quality of modern discs is more consistent with age than previously, but some variation in the behavior of the cutter under apparently identical conditions can be attributed to this cause. So buy the blanks as you need them and stick to the one brand for which you have initially adjusted your equipment.

Recordings can be made by having the stylus move laterally, from side to side, or vertically, to vary the depth of the groove. For the purpose of home recording only the lateral cut need be considered.

TRACKING

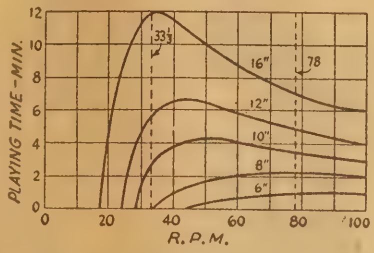
To allow positive tracking with an average good quality pickup, each groove must have a certain minimum depth and width. In addition, it must have adequate "elbow room" for the lateral variations. Taking all factors into consideration, it is usual practice to record at a pitch of about 100 lines per inch. This is naturally one of the governing factors in the playing time of a disc.

If the grooves are spaced more closely than this the dimensions must be increased and the amplitude reduced, calling for a high degree of precision in the recording and the reproducing gear and careful control of the disc quality, if the noise level is not to become excessive. A coarser pitch, on the other hand, is simply wasteful of playing time.

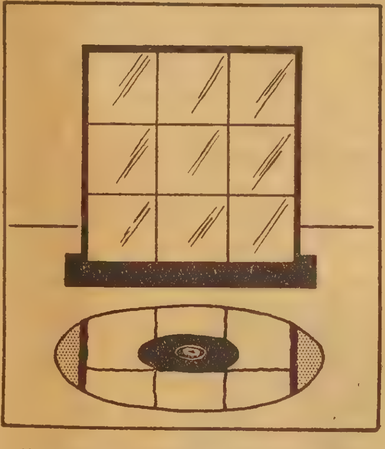
The second main factor is the rotational speed of the disc. A slow speed lengthens the playing time but has the effect of reducing the physical wavelength of any frequency being recorded. The effect is naturally worse near the centre of the disc, where the lineal rate of travel of the disc surface under the stylus is much slower than at the outside.

For high audio frequencies the physical dimensions of the recorded wave near the centre of the disc approach those of the stylus and reproducing needle, which simply means that they cannot adequately be recorded, even taking into account electrical compensation.

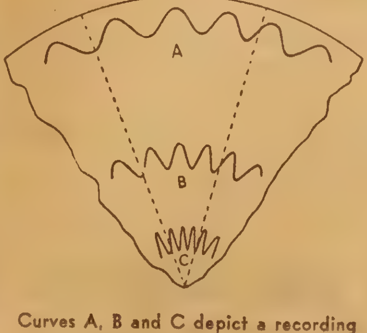
A speed of 78 rpm is recognised as standard for the ordinary commercial pressings, while 33 rpm is used for long-playing transcriptions. Assuming that frequencies up to 8000 c/s are required. longest playing time is obtained from discs up to 10 inches in diameter at 78 rpm. The reason for this is simply that the groove speed at 33 rpm near the centre of a small disc is too slow for reasonable fidelity.



This chart shows the playing time against groove speed for records of different diameters. The chart is based on 96 grooves per inch and sinoidal reproduction up to 8000 c/s.



To guage the flatness of a disc, hold it so that the surface reflects the bars of a window or lines on a specially ruled card.



Curves A, B and C depict a recording of the same frequency at different groove diameters. Note how the smooth curve at A is compressed into the steep-sided pattern at C.

With a 12-inch disc there is little to choose, the 33 rpm recording showing a very slight advantage. And, with a 16-inch disc the advantage is very clear with the 33 rpm recording. More will be said of the effect of groove speed in connection with the amplifier characteristic.

DRIVING GEARS

Having now some idea of discs and their characteristics, the next problem is to arrange a suitable turntable mechanism. The requirements here are constant speed, adequate torque and complete freedom from vibration. Speaking generally, one seldom finds all three of these properties in adequate measure in an ordinary playback gramophone motor.

Since the stylus is actually cutting through the disc surface, the drag or loading on the turntable when recording is much higher than when playing back. Hence a motor which has adequate power for the record playing may slow down under the heavier load. Under these conditions, the governor ceases to exercise adequate control over the speed, with the result that unpelasant "wows" ruin the whole effect of the recording.

THRUST BEARING

Under the heading of torque and constancy of speed, one must also consider any slight eccentricity of the driving gears, which will accentuate the trouble. A motor which may be satisfactory under the light loading of playback conditions, can be quite hopeless for recording purposes.

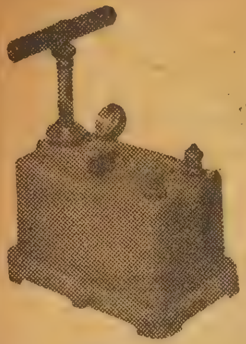
A further point is in the matter of vibration, which may come from the governor, from gears or bearings, or from the a-c windings in the fields or armature. Any such vibration of the turntable beneath the stylus causes modulation of the groove, which will further be accentuated by any inherent bass boost in the pick-up or amplifier.

The difficulties are overcome in part if a heavy turntable can be provided either by turning from solid plate or by flowing lead into a hollow pressed metal turntable and subsequently trimming it for balance. The same driving torque is required, of course, but the inertia of a heavy turntable tends to obviate periodic variations in speed and also to absorb vibration.

Occasionally this treatment can be applied with success to an ordinary playback motor, but it is important to see that the thrust bearing is capable of taking the extra weight and that the gears are adequate for the task. But, generally speaking, the majority of playback motors are just not quite equal to the requirements.

Therefore, unless Lady Luck is co-operative, the home recordist usually has to consider buying or making a turntable for the purpose. Recording turntables are usually turned from solid metal, carefully balanced and mounted on a bearing free from loseness or rumble.

(To be continued)



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PEDAL OPERATED BATTERY CHARGERS. Can be driven any Farm Machine. **£4/19/6.**

MULTI-METERS, Read 0.10 mill., 0.250 mill., 0.50 mill., 1250v. **32/6**

0/14v., 0/250v. double reading Meter. 1000 ohms per v. 14/6
Excellent carrying case for same 2/6

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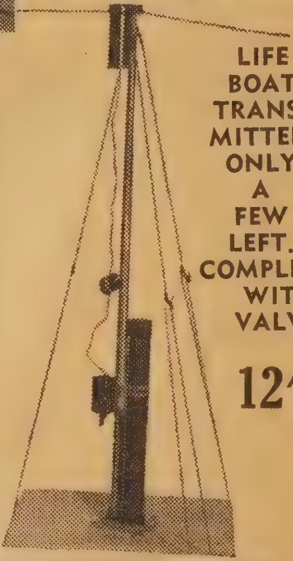

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FROM THE SERVICEMAN WHO TELLS

Some relatives in the country insisted that I should spend a weekend with them and asked, as an after-thought, that I bring something to test Mr. So-and-so's amplifier, which was giving him trouble. Mr. So-and-so was a nice chap and I would be helping him and everyone else concerned if I could rectify the trouble. You know how it is in the country. So, in with the "odds and sods" for a weekend jaunt. I packed in the multi-tester and a variety of tools and spares to complete what I hoped would be a simple job.

ON the Saturday morning, thinking to get the job over and done with, I went to see Mr. So-and-so and enquire about the cause of all his trouble.

It turned out that he owned the local public hall, and his latest venture was to instal an amplifier system with the idea of running small functions and dances for charity. You know the idea. A small charge to go in, practically no costs and amplified recordings to substitute for an orchestra.

Without saying as much to our friend, I thought him rather an optimist. I stand to be corrected but have doubts about the success of such a scheme—unless one of the locals happens to be a genius as an MC. People may dance to canned music occasionally in an informal house party but, in a public function, they prefer a live orchestra on the stage — even if it is only a piano and violin combination.

THE PROBLEM

What all this has to do with radio is rather beyond me, but even a radio serviceman sometimes has opinions of his own.

Mr. So-and-so explained that he had bought the amplifier from a chap in the neighboring town and had installed it himself. Said he: "It seemed terribly loud when I first heard it but it gets harsh when I turn it up in the hall."

This was not a startling statement, by any means. Even a couple of watts sounds awfully loud in a small acoustically "live" room. Heard in a large hall, the same output is lost in the open expanse of free air and the lofty ceiling. Add to that the absorption of an audience and the shuffling of a couple of hundred feet and you may have to listen hard for the tempo.

Mr. So-and-So's amplifier turned out to be a push-pull circuit of fairly standardised pattern and with a power output of about 13 watts. This should have been enough for the particular hall, but I must say that the output did not sound very high in the quiet hall before overload distortion became evident.

INSTALLATION

The amplifier was actually installed in a room which housed the light switches and was intended to serve as an operating booth for film shows. The speaker was installed in a good position above the proscenium at the other end of the hall.

It is worth noting, in passing, that a high position for such a speaker is always desirable. Point it obliquely downwards towards the far end of the hall and there is a good chance of people at the back hearing the sound to good advantage without blasting the ears off those at the front.

What interested me more was the method of conveying the output from the amplifier to the loudspeaker. Closer investigation showed that the output transformer was mounted on the amplifier chassis, the secondary leads being extended to the voice coil. The speaker itself was a prewar 12in. permagnetic of fairly good design and with a voice coil impedance, from memory, of just over one ohm.

While this speaker may not have been right up to the standard of modern types, as far as sensitivity goes, I knew that it could not be blamed for the obvious lack of volume from the amplifier system. So I checked the connecting leads.

Our friend had apparently bought a roll of twisted light flex and run it from the amplifier, up through the ceiling and along the side of the hall, down the full length of the building and ultimately to the loudspeaker. He had certainly gone to a lot of trouble to put the lead in a safe and tidy place and held it rigid by insulated staples. Stepping out the distance I guessed that there was the best part of 100 feet of twisted pair between amplifier and speaker.

FLEX CABLE

The flex contained 10 strands of what I guessed to be 30-gauge wire, and it was immediately obvious that considerable loss was occurring in the d-c resistance of this lead.

Wire of this gauge has a resistance of about 100 ohms per thousand feet, so that a 10-strand cable would have a resistance of about 10 ohms per thousand feet. In this installation there would have been close on 200 feet of wire—100 feet each way—in circuit between the amplifier and voice coil. The resistance of the cable, therefore, would approximate two ohms.

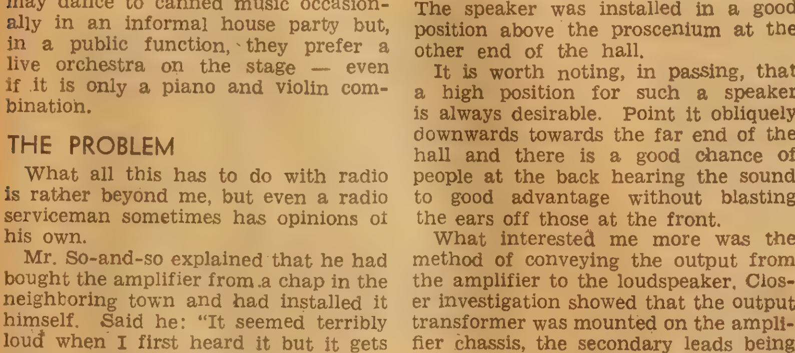
So we have the amplifier valiantly delivering its output into a secondary load of about 3.2 ohms instead of 1.2 ohms. The reflected load across the primary would be, theoretically, 26,000 odd ohms instead of the requisite 10,000 ohms for the particular output valves. And as for power output—well I guess that one might get about half the expected audio with such a drastic mis-match.

CABLE LOSS

So our friend was feeding, say, seven watts into one end of the twisted pair, and, of this, only a portion was serving to operate the voice coil. The rest would have been dissipated in the 2 ohms resistance of the cable. Hence only three or four watts would have been actually available to the loudspeaker.

I may appear to be devoting a lot of space to this matter, but it applies to anyone who may wish to operate a loudspeaker remote from an amplifier or radio set.

Where the connecting leads are more than two or three feet in length, it is wise, as a general principle, to mount the output transformer on the chassis and extend the secondary leads. In



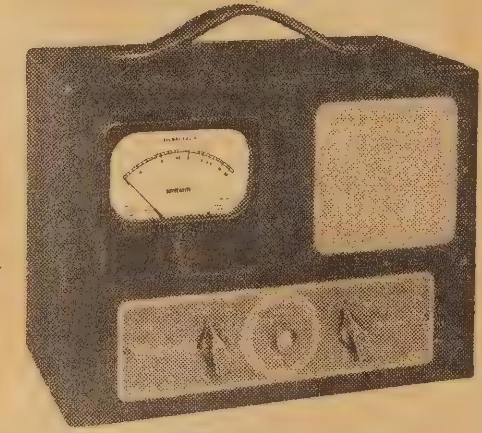
Extension of the plate leads, as at (a) involves some risk of instability. When voice coil leads are extended, as at (b), the resistence of the leads must be kept small in comparison to the impedance of the voice coil.

4 VALVE A.C. KIT SET

Neat Kit is Easily Assembled

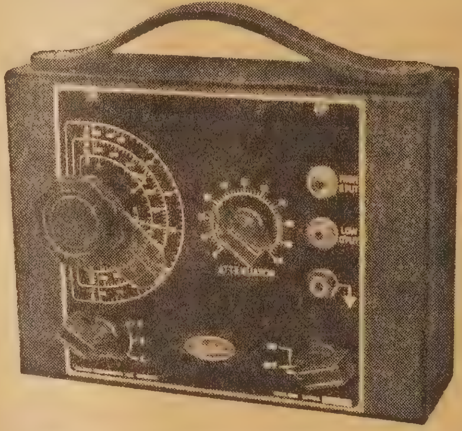
If you would like to build a really professional receiver, this 4-valve broadcast operated mantel set for 240-volt A.C. operation is ideal. In plastic cabinet. Colours: ebony, walnut, green or cream. This set comes complete with all necessary parts, including valves and Rola 5in. permag speaker. Circuit diagram and building instructions are included.

Price, £12/15/3 (plus freight). Green or cream, 15/- extra.



SIGNAL TRACER

Tracing the signal RIGHT THROUGH the radio receiver from start to finish, the new "University" STB Signal Tracer makes fault-finding easy and quick. When the probe strikes a faulty section, indications are given on both meter and speaker. Portable—light—sturdily constructed, the STB is the versatile post-war service instrument you MUST have. Ask for Model STB "University" Signal Tracer. Price £14, plus tax.



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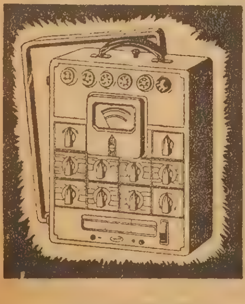
Designed to give years of accurate service yet simple to build at home with a few ordinary tools, the new University OKI oscillator kit covers all fundamental frequencies in the average receiver. Dial is specially calibrated. Kit uses standard batteries. Every OKI kit is complete with instruction book giving pictures and wiring diagrams, and all parts at the new low price of £7/10/- plus tax.



UNIVERSITY SUPERTESTER (Left)

This is the most versatile Valve and Circuit Tester, featuring the extraordinary roller test chart—entirely new to Australia. Send for free descriptive brochure on this and other "University" instruments.

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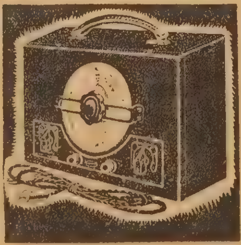

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WHOLESALE DISTRIBUTORS OF EVERYTHING IN RADIO

the first instance, this removes the danger of having long flex leads around the place carrying up to 400 volts of d-c plus the audio "ergs." More important still, it minimises the risk of instability which always attends the extension of plate leads over long distances.

But—and it is a very big "but"—watch the resistance of the wiring to the voice coil. There is certainly no d-c to worry about and very little risk of instability troubles. But—you are now delivering the power into a load of very low impedance, and it is essential that the d-c resistance of the connecting leads be small compared with the impedance of the voice coil.

STANDARD PRACTICE

Our friend was particularly unlucky in that he was using a very low resistance speaker with a long length of light flex. The loss would still have been serious with a 2 or 3 ohm voice coil, but of little importance with one of eight or more ohms.

Standard practice in sound engineering is actually to fit amplifiers with output transformers with a secondary winding intended to operate into about a 500 ohm load. The loudspeaker system is then fitted with a second transformer to give an impedance transformation from 500 ohms down to the impedance of the voice coil or coils, as the case may be. The lead connecting the two transformers is then referred to as a 500 ohm line, because it operates from a 500 ohm source, and is terminated by a 500 ohm load.

Actually, one could choose an intermediate impedance value for the line at anything from a couple of hundred ohms to a thousand ohms, but the conventional 500 (or 600) ohms is a nice round figure, which has come into general usage. The impedance of a 500 ohm circuit is high enough not to be adversely affected by the d-c resistance of a few hundred feet of lead. But, the impedance is not so high that losses are likely to occur due to capacitance between the leads.

500-OHM LINES

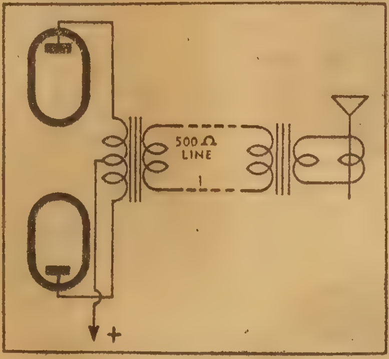
Coming down to finer points, one can run unshielded input leads and use switching and attenuator circuits in a 500 ohm line, which would be very difficult, if not impracticable, in a circuit of much higher or lower impedance. So much for 500 ohm lines and networks which so many folk appear to regard with technical awe.

Actually, it is dubious practice to use a 500 ohm link where the length of connecting cables is not excessive, unless it is for reasons of convenience or versatility. Matching transformers average only about 80 per cent. efficiency so that the losses involved in an extra and unnecessary transformer may be equal to or greater than those in a direct low impedance cable.

Looking back through the pages, as I type, I feel that this discourse is truly encroaching on grounds sacred to the Technical Editor, but I must crave his forbearance. Maybe it will be a pleasant change from the eternal round of shorted bypass condensers and pesky open-circuited coils. But I must conclude the matter.

Appreciating the difficulty which faced Mr. So-and-so, I obviously had to find a way out, and 500 ohm line transformers don't grow on trees in the country—or the city either, for that matter. There was nothing else for it.

I removed the output transformer from the amplifier and clambered up to install it in its original position on the loudspeaker. The amplifier wiring was rearranged to lead the valve plates to the output socket and thence via the twisted cable to the loudspeaker. Instead of making a direct connection to the plug, I wound about 20 turns of enamelled copper wire round a pencil and stretched it slightly to link the plate pins with the output socket. The idea was to make it function as an RF choke.



Losses due to resistance and capacitance of extension leads are avoided by stepping down to an intermediate impedance value, generally about 500 ohms.

A third lead was obviously necessary for the B-plus line, and this was run through to the speaker with some single core electrical cable which happened to be available. When the amplifier was switched on, there was fortunately no evidence of instability, either in overheating of the valve elements of a change in plate current as the plates were shorted across.

But the volume was there in no uncertain manner, and I left our friend in a very happy frame of mind. It is good for one's ego to be the hero of the piece rather than the necessary evil who fixes the radio and walks off with a proportion of the "hard-earned."

* * *

A SECOND JOB

News of one's arrival travels rapidly by "bush telegraph" in small country towns. Especially when one happens to be a radio serviceman, and the town in question boasts "no such animal." Hardly had I finished lunch when a farmer from a couple of miles out came looking for me and asked me to look over his set. "It still goes," he said, "but doesn't get all the stations like it did when new."

So out we went to his small general farm. I must say, in all fairness, that the family turned on a delightful afternoon tea and subsequently loaded

(Continued on Page 78)

"BRS" JUNIOR RECORDER & PLAYBACK UNIT

* Suitable for use with Recording Amplifier described in September issue Radio & Hobbies.

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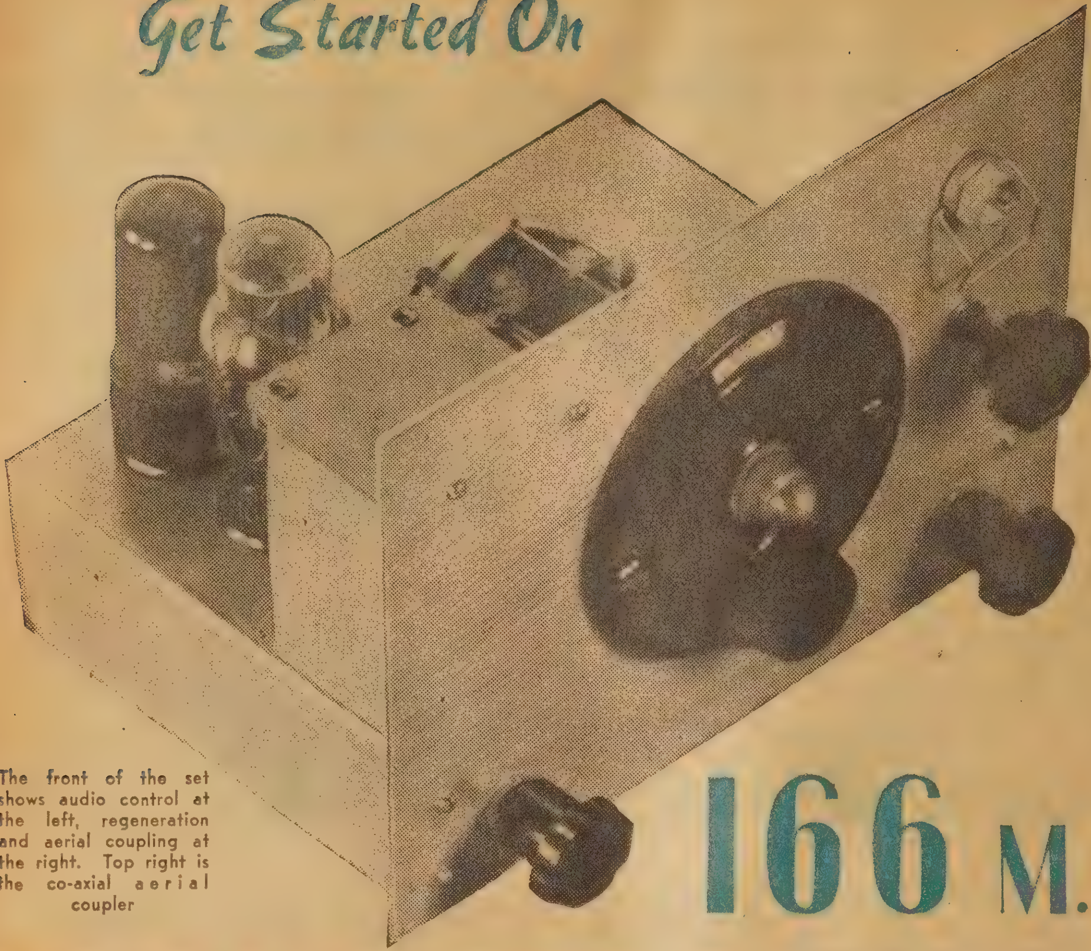
Get Started On 166 M.C.



The front of the set shows audio control at the left, regeneration and aerial coupling at the right. Top right is the co-axial aerial coupler

This article describes the construction of a simple super-regenerative receiver to operate on the 166 megacycle amateur band. Many stations are to be heard operating there these days, and both amateurs and listeners will find much to interest them in this easy-to-make set.

by John Moyle VK2JU

THE signs of the times as represented on the ultra-high frequencies are to be seen in the activities of licensed amateurs these days.

While the DX bands are and always will be popular, an increasing number of amateurs is exploring the possibilities of the UHF bands. These are, in effect, in the vicinity of 50 and 166 mc, as still higher frequencies, which amateurs can use, call for equipment not normally in the possession of the average man.

THE 50MC BAND

The 50 mc. band, once the realm of modulated oscillators and super-regenerative receivers, has now graduated into the realm of stabilised technique. No one contemplates using such elementary gear now on 50 mc. Almost without exception, transmitters for this band are crystal controlled, and receivers are superhets, or superhet converters.

But 166 mc. is a different story. It is much more difficult to make crystal-controlled transmitters for this band, and, for that matter, superhet receivers. Certainly they will cost more. For this reason alone and also because it is now the "pioneer" UHF band, as was the 56 mc. before it, the use of simple gear on 166 mc. must be considered legitimate.

The obvious difference between the two types of equipment is that modulated oscillators are nearly always accompanied by frequency modulation, which makes them very broad, against the sharp, clean carrier which marks the stable crystal-controlled transmitter, or its equivalent.

Super-regenerative receivers, particularly those of the type described here, use an oscillating detector, which will radiate energy just as will a small transmitter. This radiation will cause interference with other receivers operating in the immediate vicinity, which can be very strong and troublesome under certain circumstances. However, these are things one must be prepared to accept as more or less necessary evils, and with a little co-operation and care, their effects can be reduced considerably.

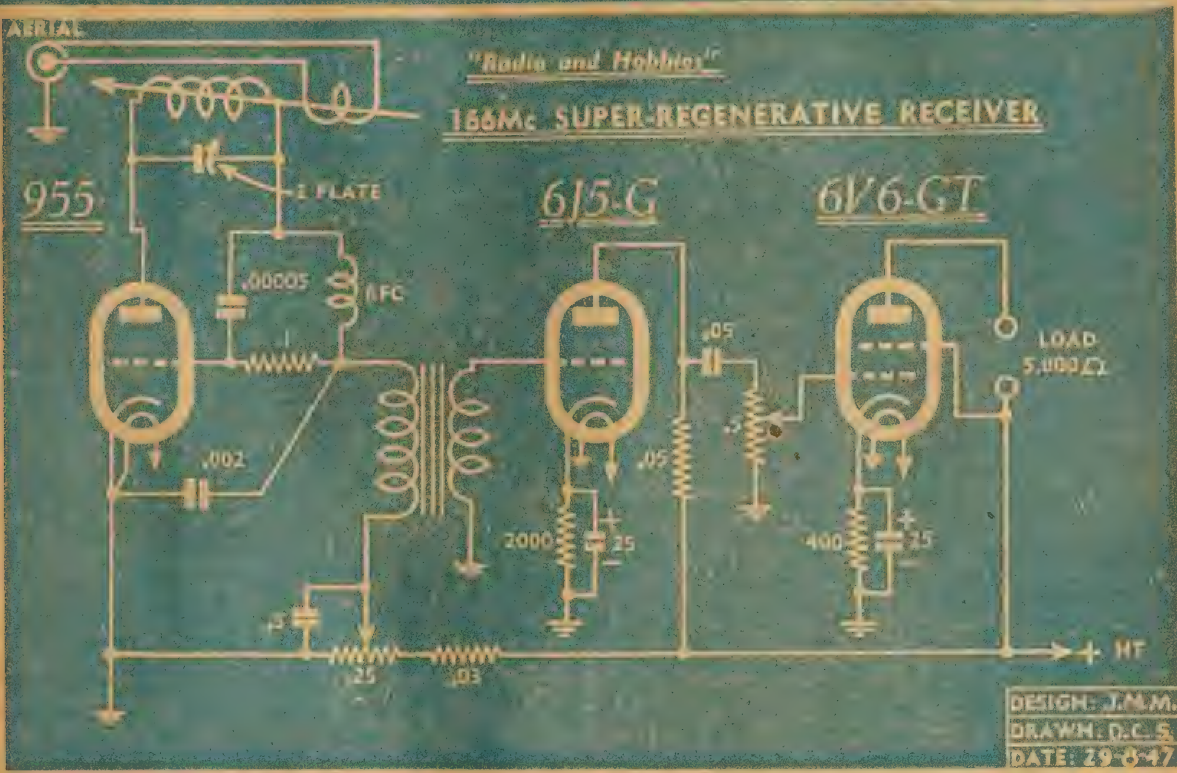
SIMPLICITY

On the credit side, the simple apparatus can be made to operate well with very little trouble, and is cheap to build. To the man who has invested most of his available money in apparatus for the lower frequency bands, this is quite an item, and must be considered by those who normally, and with some justification, frown on the use of any gear which tends to interfere with the work of others.

At the same time, we must remember that amateurs are entitled to experiment—something we tend to forget in a world of regular frequencies, communication, and schedules. They are allowed to use simple gear on the 166 mc. band, whilst on the 50 mc. and lower, stabilised transmitters and non-radiating receivers are required. For this reason alone, we have no qualms about describing the receiver illustrated herewith.

In our Short Wave Handbook, to be published almost immediately, we will give details of a simple transmitter to operate in conjunction with this set, and from the same power unit.

CIRCUIT DIAGRAM OF THE 166 m.c. RECEIVER



There is little difference between this circuit and the standard arrangement for this band.

There are very few variations one can apply to a simple super-regenerative receiver. General practice has standardised on the self-quenched type, as the alternative to a set using a separate quench oscillator. The latter uses more equipment, and its advantages are doubtful.

OSCILLATION FREQUENCY

The simplicity of the detector circuit shown here is obvious. We do not intend to describe fully the theory of super-regeneration, as it is fully set out in various handbooks, and isn't a thing to be covered in a few words. There are two oscillation frequencies involved, firstly the signal frequency, and secondly the quench frequency. This latter tends to send the detector rapidly in and out of oscillation at a rate equal to the quench frequency. Thus the set is maintained in a very sensitive condition, but obviously, as it is connected directly to the aerial circuit, radiating all the time, after the manner of oscillating valves.

To make the detector super-regenerate, the grid leak as you will notice s connected to a positive voltage, ather than to earth as is normally the ase. So don't think this is a circuit rror, assuming you haven't met up vith a circuit of this type previously.

We have used a 955 Acorn valve ere because it is about the best type o use, and is now obtainable for somehing less than the price of normal eceiving valves. The 9002 is another alve which could be used with equal uccess, being very similar electrically. Valves such as the 6J5 are somemes used, but we don't advise them. For one thing, they are harder to get oscillating, will require more voltage, and will therefore radiate much more strongly. The 955 will oscillate readily with about 25 effective volts on the plate, and the amount of power fed into the aerial circuit is therefore very small indeed. The CV6, or 7193, is a special form of the 6J5, and will probably work just as well as the Acorn, and with about the same voltage. The layout must be modified to use this valve.

TUNING CIRCUIT

The tuning circuit is very straightforward. Variations will be found at times in which, for instance, the R.F. choke is connected to the centre of the coil. While theoretically this is the logical place for it, in practice we didn't find it made any difference, and it is generally more convenient to connect it directly to the grid, as shown. Mounting the valve socket upright, and back of the tuning condenser, means that grid and plate leads to the valve are kept very short—an essential precaution on this frequency. The plate lead is less than one inch long, and the grid lead is actually composed of the grid condenser itself, with the pigtails cut short.

The other fixed condenser, above the chassis, and visible in the illustrations, is the 002 mfds. condenser, which is earthed to the same spot as earths the cathode. The grid leak

PARTS LIST

1 Chassis, 8in. x 6in. x 2in.
1 Front panel, 9in. x 6½in.
1 2-Plate midget variable
1 Audio Transformer.
1 Reduction drive dial.

CONDENSERS:

2 25 mfd. 40 PV. electrolytic, 1 .5 mfd. tubular, 1 .05 mfd. tubular, 1 .01 mfd. tubular.
1 .002 mfd. mica, 1 .00005 mfd. mica.

RESISTORS:

1 .1 meg., 1 .05 meg., 1 .03 meg., 1 2000 ohm, 1 400 ohm.
1 .5 meg. Potentiometer, 1 .25 meg. potentiometer.

SOCKETS:

1 Acorn valve socket, 2 octal, 1 5-pin.

VALVES:

1 955, 1 6J7G, 1 6V6GT.

SUNDRIES:

1 5-pin plug, 1 insulated coupling, 1 coaxial cable panel mounting socket, 3 knobs, 4in. insulated rod, ¼in. dia., resistor strip, 6in. shielded wire, panel mounting bushing, hook-up wire, spaghetti, nuts and bolts, &c.

COIL DATA:

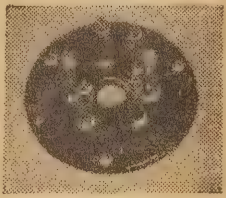
Tuning coil: 3 turns ⅜in. dia., 18 s.w.g wire.
Aerial coil: 3 turns ½in. dia., 18 s.w.g. enclosed in spaghetti.
R.F. Choke: 23 turns closewound, [illegible] dia., 22 s.w.g.

EDDYSTONE

TRANSMITTER COMPONENTS

"Eddystone" components, precision manufactured, are designed to meet the needs of the Radio Engineer and Short Wave Experimenters. "Eddystone" products are renowned for the highest degree of efficiency and for outstanding performance.

LOW LOSS COIL BASE

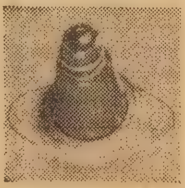


Chassis mounting coil socket for use with Eddystone Low Loss Interchangable Coils. DL9 insulation with three fixing holes. A 1¼in. diameter hole is required in the chassis. Cat. No. 964.

MINIATURE STAND-OFF INSULATOR

A midget insulator made from Frequentite with N.P. brass parts. A useful accessory in the design of ultra short wave receivers and transmitters. The new quality Frequentite closely approaches quartz in its characteristics as a low loss dielectric at high frequencies. Cat. No. 1019.

MOULDED INSULATOR



This moulded insulator will be found extremely useful as "Stand-off" Insulator, "Lead-through" or "Terminal Post." It is supplied in two colours, red or black. Construction is such that neither the insulator portion nor the screw will revolve when wires are attached and tightened. It is made with reversible fittings so that it can be mounted above or "through" the chassis. Each insulator is provided with two 2BA nuts and shake-proof washers. They are satisfactory for 1000 volts working. 1½in. high, 1¼in. between fixing screws.

Cat. No. 564, Red. Cat. No. 565, Black.

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bridges from the grid terminal across to the end of the R.F. choke, which lies parallel to the front panel immediately below the tuning condenser shaft. You can see the front end of the choke in the pictures, its rear end being obscured by the tuning condenser.

TUNING CONDENSER

The tuning condenser must be insulated by mounting on a strip of good material, of which there are plenty of samples available from disposals equipment. Even good bakelite would probably be OK. An insulated coupling must be used for the shaft, and it is best to mount the whole assembly, as we have done, well back from the panel. This condenser is a 2-plate, midget type.

The tuning coil, as will be seen, is mounted directly on the tuning condenser, and juts out at the side, so that it may be coupled easily to the aerial coil.

We mounted the aerial coil by slipping a piece of insulation tubing over the end of the shaft, and fixing the ends through a couple of holes with a drop of acetone cement. The shaft is rotatable from the front panel, and supported in a tight-fitting bearing, taken from an old volume control. Some kind of spring tension may be fitted against the shaft if it is too loose, to prevent the loop from falling down under its own weight.

AERIAL COUPLING

This aerial coil adjustment is important, so take your time over it, and make a good job. Some insulated covering should be used on the wire to prevent it shorting to the tuning coil.

Use heavy gauge wire for both these coils—at least 18 gauge. Silverplated copper is best, although enamelled wire will do just as well in this circuit.

The remainder of the circuit is self-explanatory. It might be possible to do without the last audio stage, although for loud-speaker work, the extra audio gain is valuable.

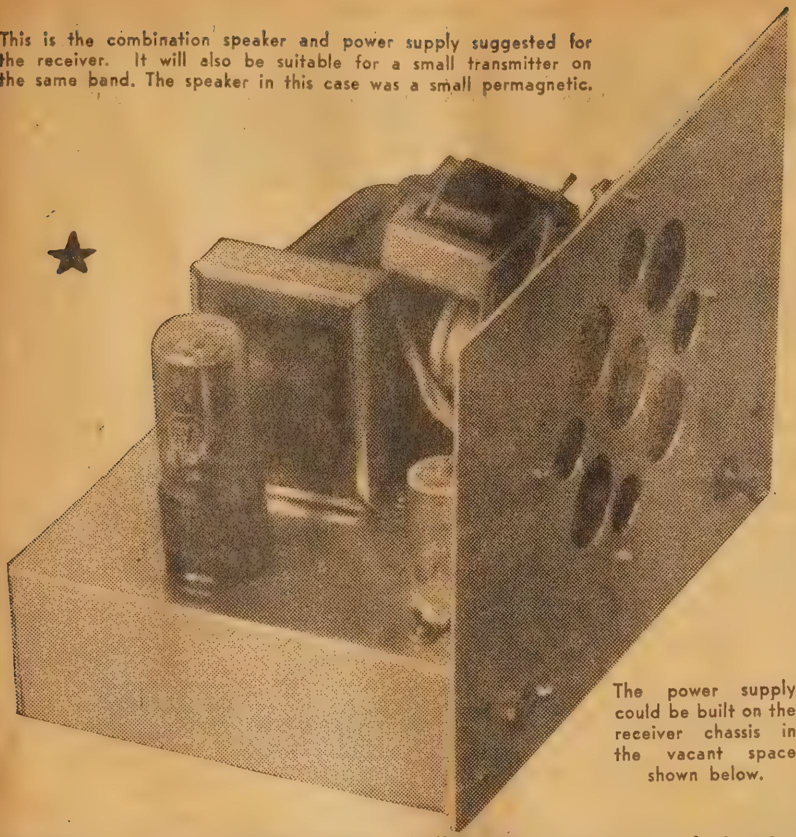
The audio transformer is a necessary component, but almost any type will serve. Ours was actually a sample job we have had for years, and there is no significance attached to its type. A good one would be the old Philips type, of which there are many in circulation.

We used a co-axial connector for aerial connection—a pair of terminals would do here just as well. Insulation is not so important, as the impedance in the aerial circuit, and consequently the R.F. voltage is quite low.

The chassis is large enough to build a small power supply on the vacant portion, using a 40 mill type transformer as sold for mantel sets. However, we used a separate supply built on a chassis the same size as that of the set, with a switch to change it across to the transmitter as required This supply also houses a small loudspeaker, so that the three units make up a self-contained station. You can please yourself entirely on this point Any voltage from 150 to about 300 will be OK, the only difference being in the amount of audio available.

The two major points in getting the set to operate are, firstly, in the

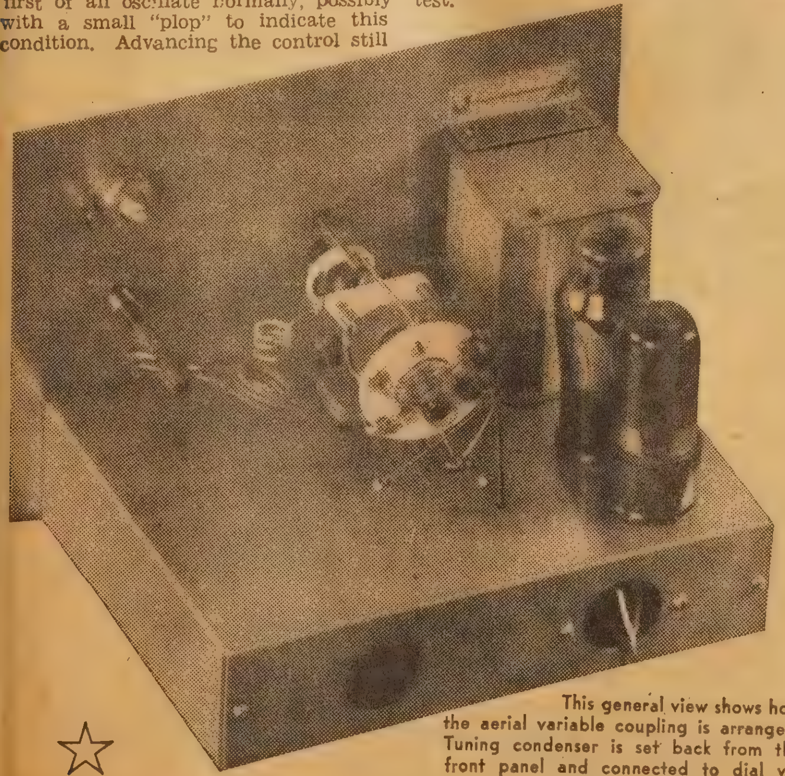
This is the combination speaker and power supply suggested for the receiver. It will also be suitable for a small transmitter on the same band. The speaker in this case was a small permagnetic.



The power supply could be built on the receiver chassis in the vacant space shown below.

adjustment for best super-regeneration and, secondly, finding the 166 mc band.

If the values have been as set out, including the coil data, the set should operate immediately. On advancing the oscillation control, the valve will first of all oscillate normally, possibly with a small "plop" to indicate this condition. Advancing the control still further will commence a gradual rushing sound, building up to considerable proportions. This indicates super-regeneration, and is a necessary condition for proper reception. The aerial coil should be moved away from the tuning coil while making this first test.



This general view shows how the aerial variable coupling is arranged. Tuning condenser is set back from the front panel and connected to dial via a flexible coupler.

PERFECT PROTECTION ..from moisture

Permanency of Insulation resistance depends primarily upon the complete exclusion of moisture from the capacitor element. Tests have proved that Ducon capacitors can withstand many cycles of the standard humidity cycle test without any mechanical or electrical deterioration.

Type PC Tubular capacitors have been designed to meet the recent exacting demands of the electronic industry for a high grade capacitor.

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RELEASING

"VIBRAPOWER"

VIBRATOR POWER SUPPLY TYPE V.S. 140.

GENERAL. The Ferguson "Vibrapower" unit is a compact, self contained vibrator operated power supply designed to operate from a standard 6 volt accumulator.

The unit has been designed to simplify the conversion of battery operated radio receivers over to vibrator operation. However, it may be used as a replacement for "B" batteries in portable equipment, or as a complete power supply for standard vibrator receivers.

DESCRIPTION. A fabricated steel case measuring 9½" x 6" x 4" finished in grey wrinkle duco, and fitted with rubber mounting feet, houses the unit. A carrying handle is also fitted to the case for ease in transportation.

Weight .. ..10 lbs..

ELECTRICAL SPECIFICATION. Two output circuits are provided, one is a filtered low tension 6V filament supply, which can be used with current drains up to 300 mA. The other is the normal high tension supply, which will deliver an output current of 20 mA (max). The output voltage under these conditions is 140 volts D.C.

Both L.T. and H.T. outputs are adequately filtered for A.F. and R.F. noise

INPUT	OUTPUT
6v. at 0.95 Amp.	140v. at 0.02 Amp.

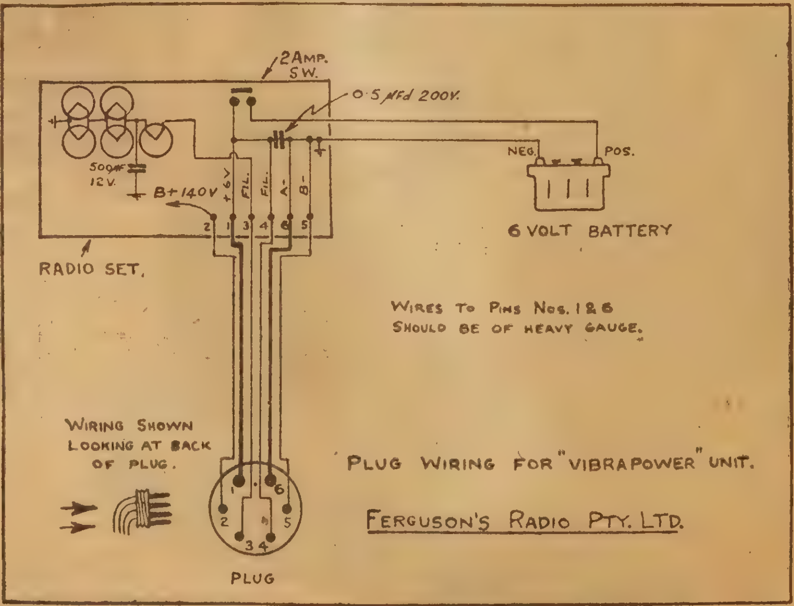
CONNECTIONS FOR USE. The input and output connections are made by means of a standard six pin plug, which is inserted in the socket provided at the end of the unit. Wiring to the plug is shown in the accompanying diagram. It is important that the recommended wiring to the receiver be observed, otherwise trouble may be experienced due to false earths, and "hash" may become apparent over portions of the short wave band. No trouble is experienced if the wiring diagram is adhered to.

OPERATION. Since the output voltage polarity is determined by the polarity of the input, it is important that the supply leads from the radio set are connected to the correct terminals on the accumulator. Incorrect connection will result in non operation of the radio, and damage may be caused to the condensers and vibrator cartridge in the "Vibrapower" unit.

One of the outstanding features is that either a Ferrocart Type P.M. 413 or an Oak Type V5124 vibrator cartridge can be used without any change in the operation of "Vibrapower."

When installing or replacing a vibrator cartridge, the six screws holding the base of the case should be removed, the lid slid off, and the cartridge inserted.

AVAILABLE LEADING WHOLESALE AND RETAIL HOUSES.


2 AMP. SW.
0·5 MFd 200V.
500MF 12V.
B+ 140V
+6V
FIL.
FIL.
A-
B-
2
1
3
4
6
5
NEG.
POS.
6 VOLT BATTERY
RADIO SET.
WIRES TO PINS NOS. 1 & 6 SHOULD BE OF HEAVY GAUGE.
WIRING SHOWN LOOKING AT BACK OF PLUG.
PLUG
PLUG WIRING FOR "VIBRAPOWER" UNIT.
FERGUSON'S RADIO PTY. LTD.

FACTORY REPS.: N.S.W., VIC. & QLD., ELECTRONIC INDUSTRIES IMPORTS PTY. LTD
S.A., APEX AGENCIES.

Leaving the matter of the aerial for the moment, you should find 166 mc with the tuning condenser about half-way in. There are generally a number of stations operative from 7.30 to 9 almost any night, and often outside these hours, of course. In addition, there is the "SY" beacon, a harmonic which can generally be heard at 166.5 mc.

When listening for stations, the aerial coil is moved close to the tuning coil. When very tightly coupled, it will probably pull the set out of oscillation, and you must back it off until oscillation recommences.

Experiment with the controls will show that best signals are heard with the aerial coupled as closely as possible. As soon as a station is tuned in, it will automatically reduce the rushing in the speaker and, on strong stations, this rush may stop altogether.

The adjustment of the aerial control will soon be found to be the most important. It is possible to leave the oscillation control well advanced, and rely entirely on the tuning control and the aerial coupling control. Only practice will allow you to work out the best way to handle them.

THE AERIAL

The aerial is an imporant part of the set-up, and calls for special mention. Unlike the "short waves," one does not merely string up a wire and tune in. A resonant aerial must be used.

This consists in simple form of a half-wave antenna cut in the centre to form two quarter-waves with the ends separated by about one inch. A length of co-axial cable is connected to the two ends, the outer to one, and the inner to the other. The other end of the cable is connected to the aerial socket or terminals, as the case may be.

The best set-up is one in which the aerial is mounted outside well clear of the ground. However, in the case of nearby stations, it is quite possible to use an aerial inside the room mounted clear of obstacles. The co-ax cable can be replaced quite successfully with two lengths of hook-up wire loosely twisted together, about six times per foot, to serve as a feeder. If you are in an elevated locality, you should be able to hear stations on such an aerial. Most transmitters have vertical aerials, so arrange for yours to be vertical. When you have tuned in a station, you will observe many interesting effects by rotating your aerial, and noting the changes in signal strength.

The aerial elements can be made of stiff wire mounted on stand-offs, and supports by a wooden batten. The feeder should come away at right angles for at least six feet or more before it drops into the receiving room.

The exact length of the aerial sections will depend largely on the exact frequency used. A good length for a start is 16½ inches for each quarter-wave, making an overall length for the half-wave of 33 inches.

Various combinations of aerial elements can be made to form simple beams, with much improved results. You are advised to read the various amateur handbooks on this subject, as there is far more information given there than we have space for in this article.

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E.F. 50 High Gain R.F. PENTODE	17/3
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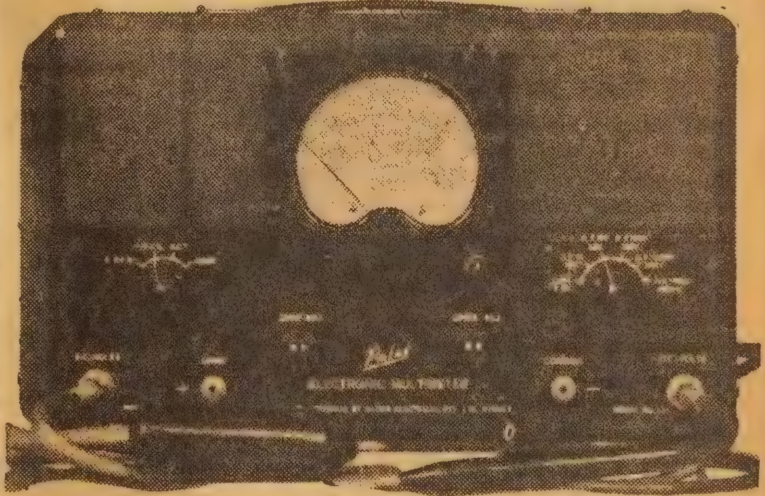
41 MXT OUTPUT PENTODES	14/-
807 Beam Power PENTODES	16/6
VCR 112 5" Cathode RAY TUBES	30/-*

* Plus Sales Tax

The Latest in Radio Testing Equipment

"PALEC" V.T. (Probe) MULTIMETER



MODEL V.T.M. Every Amateur will find this the most useful test instrument yet devised—WRITE US FOR FULL PARTICULARS. This is a winner! and only **£29-10-0**
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MULTIMETERS with 10 Ranges housed in Black Crackle Finish Cast Aluminium Case £6/19/6

Large Full Vision Dials only 10/11

Magnetic PICK-UPS .. 25/6

5 Way BATTERY CABLE 9d. per yard.

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☆ DISPOSAL ★ SURPLUS ☆

Assorted Parcel

USEFUL RADIO & TELEPHONE PARTS

Contains Earphone, Microphone, Relay, Full wave Copper oxide rectifier, Bundle Hook-up wire, resistors and condensers.

The lot for

10/-

POST FREE

BATTERY OPERATED POWER SUPPLIES

12 VOLT INPUT GENEMOTORS.

Type No. 11 Low Power 230V Output
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These units are in good condition and are supplied in metal cases.

Type No. 19 has 2 separate outputs. one 320V Plus 550V in metal case size. These units are ideal for conversion to A.C. D.C.

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2 VALVE AMPLIFIERS

In metal case size. Battery Operated.
CONTAINS—1 VR35 Twin Triode. 2V Filament 1 VR21 Triode. 4 Transformers

BARGAIN 20/-

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¼ meg Carbon 20,000, wire wound, 2500 wire wound. These are new but have short shafts.

1/6 EACH

NAVY POWER-OPERATED TELEPHONES

Comprise double Head-set and Breast Microphone. Two of these make ideal house to house phone. No Batteries Required.

EACH SET 25/-

OPERATORS' SINGLE HEADPHONE WITH BREAST-MIKE

Standard type Carbon Mike and low resistance phone. Ideal for Switchboard.

PRICE 10/- EACH

FIELD TELEPHONES TYPE "L"

With Generator and Handset—these units have been serviced and are tested before despatch.

PRICE 70/- EACH

BATTERIES 5/- PAIR

EF50 VALVES 10/- ea.

6.3V. U.H.F., 6K7G. Guaranteed O.K,

TRANSCEIVER CHASSIS

Type No 22 covers 2-8 megs, with all parts less Valves and ANR Supply. These make good Communication Receivers.

PRICE £5 F.O.R.

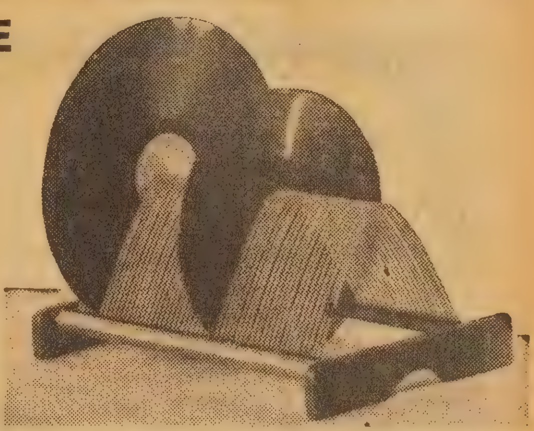
RADIO MART

439 PITT ST., SYDNEY, N.S.W.

TRADE REVIEWS AND RELEASES

SIMPLIFIES RECORD STORAGE

The problem of record storage is simplified by the use of the "Platterack", which can be used as a simple stand or built into a cupboard or radio cabinet.



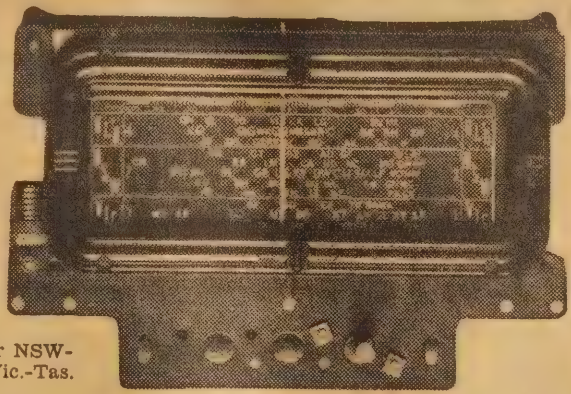
THE Platterack is essentially a simple wooden framework carrying steel wires which support the records on edge. The wires are covered with a braiding of silk and cotton to prevent scratching, while the discs rest on a silk cord.

The rack is 15 inches wide and provides space for 50 records, which may be a mixture of 10 inch or 12 inch discs. Each space is numbered and gummed labels are provided with each platterack together with a ruled sheet to facilitate indexing of discs and works.

It is interesting to note that the unit is now being incorporated by some manufacturers as a standard fitment in the more expensive radio-gramophone combinations.

The Platterack is being distributed by all music houses. The retail price is 25/- in capital cities, plus a small freight surcharge in country centres. Manufacturers are Fred A. Falk & Co., Post Office Box 28, GPO, Bondi, NSW.

SMALL STRAIGHT LINE DIAL



MOST recent addition to the Efco range of tuning dials is the USL-37G. Employing cord drive, but without a flywheel, it has three alternative positions for the tuning spindle.

The model 37G is available with an edgelit scale for either broadcast or dual-wave coverage and using the "H" gang tuning condenser. Separate scales are provided for NSW-Qld.-Vic. or NSW-Vic.-Tas. or Vic.-SA-WA.

For use in battery sets requiring no dial illumination, the dial can be supplied with a celluloid scale and is then referred to as type USL-37. Overall dimensions are 7in. x 4½in., the escutcheon opening being 5in. x 1⅞in.

NEW PHILIPS CONVERTER—ECH33

THE present shortage of type ECH35 converters will be relieved to some xtent by release of the new ECH33 riode-hexode.

These two types are identical in all espects except for heater current which, in the case of the ECH33, is 200 mA., and except in any possible AC-DC applications can be freely interchanged without alteration to circuit onstants or socket connections.

The lower heater rating of the CH33 is of distinct advantage for applications in vibrator operated receivers and also allows for the use of his type as a replacement for types K2, EK2G and EK32 in AC-DC receivers using the 200 mA. valve series. In this case, of course, the question of correct operating conditions, &c. should be taken into consideration.

Further enquiries as to prices, availability and technical information on this type should be referred to the Philips' Branch located in the capital city of each State.

Philips are also pleased to announce that a complete range of 150mA. Single Ended GT Valves for use in AC/DC receivers has now been added to the equipment types already available from stock. For the immediate present, supplies will be somewhat restricted, but commencing early October it is anticipated that sufficient supplies will be available to meet reasonable demands.

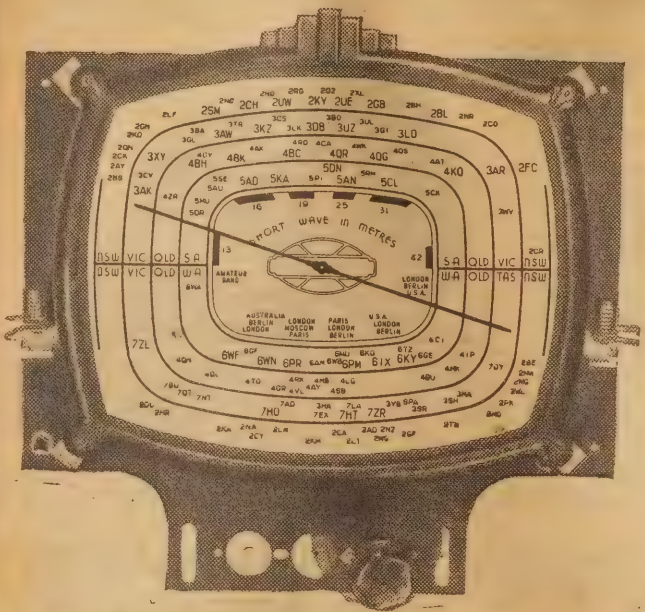
MODULATION TRANSFORMER

MOST recent addition to the range of Ferguson products is this new M-25 modulation transformer, designed especially for use in amateur transmitters. With a nominal audio power rating of 25 watts, it is ideal for modulating a final R.F. amplifier stage having up to 50 watts input.

The primary loads are 6000 and 8000 ohms, centre-tapped, and the secondary impedance ratings are 5000, 7000 and 10,000 ohms. Maximum permissible secondary current is 100 millamps. Available through all distributors or from Ferguson's Radio, 12 McMahon-street, Willoughby, NSW.

Here it is!

THE CD-31


SHORT WAVE IN METRES
NSW
VIC
QLD
SA
WA
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AMATEUR BAND
AUSTRALIA BERLIN LONDON
LONDON MOSCOW PARIS
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- Now available in B/C and D/W H, with new Edge-Lit Scale. Main local stations Green, S/W Amber, all other stations Cream.
- Three alternative positions are provided on dial plate for tuning control spindle.
- Dimensions: 10in. x 9in.

Escutcheon Opening: 7¾in. x 6¼in.

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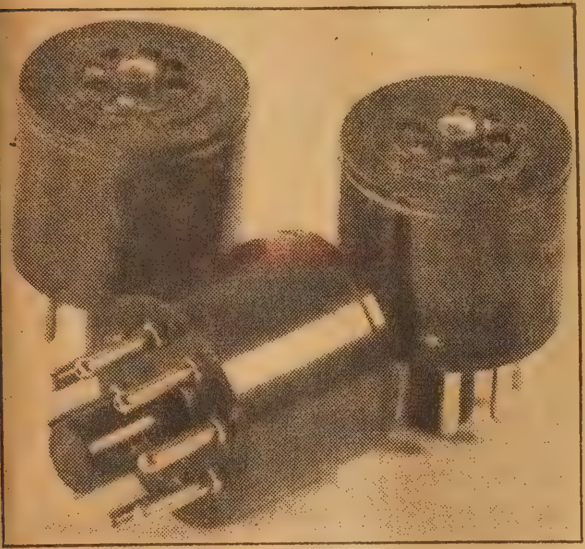
60/80 MILLER STREET, MELBOURNE. FJ9149, FJ9140, FJ4543.
367 KENT STREET, SYDNEY. M3136, MA2588.

ADAPTORS FOR BUTTON VALVES

Realising that few service valve testers could handle the new button-based valves, Philips Electrical Industries have made available a series of three adaptors which are designed to operate with most types of valve test equipment in use in Australia.

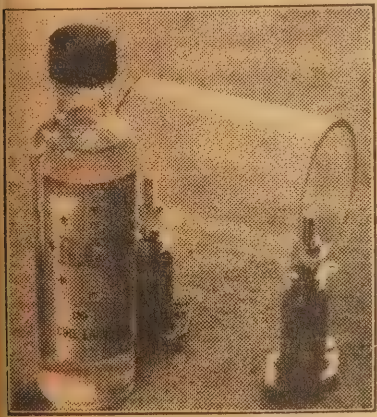


DESIGNATED as types TM1, TM2 and TM3, the adaptors simply plug into the normal octal test socket and take any one of the five locally made battery miniatures. Type TM1 tests the 3Q4, 3S4 and 1S4. Type TM2 is for the IR5, 1T4 and 3V4, while type TM3 is for the 1S5 valve.

Philips are preparing a pamphlet explaining the use of the adaptors and giving test setting for all the better known valve testers.

The adaptors are available from all Philips distributors and dealers for 4/- each.

LOW LOSS COIL COMPONENTS



ILLUSTRATED on the left are some new RCS components which will be of special interest to amateurs. Four sizes of stand-off insulators are available, moulded in trolitul, and having an overall height of 1, 1½, 2 and 2½ inches. They can be fitted with a banana socket, or nut and bolt, and are normally supplied in clear trolitul. Colors can be supplied in quantity orders.

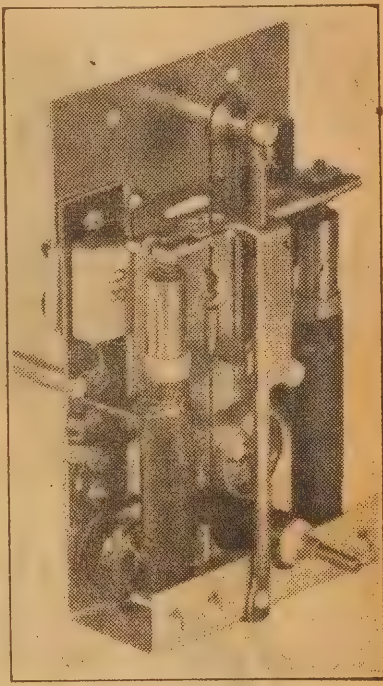
Trolitul tubing, fitted with banana plugs is available for use with the insulators, the overall length being 2½ inches and the diameter, either 1¼ or 1½ inches, as required.

To hold the wire secure, RCS have also released trolitul cement, which is normally supplied in 1oz. bottles.

KINGSLEY KFJB TUNING UNIT

SIMPLICITY is the keynote in the design of the new KFJB Kingsley Ferrotune unit. Operation of the tuning spindle varies the position of the iron slugs in the aerial and oscillator coils, which are mounted in the same plane, one on either side of the unit.

Cord drive is employed, and an important point is that the spindle turns through only 180 degrees, making it possible for the unit to be used with a conventional dial movement and a suitably calibrated dial glass.



It is intended mainly for use with 3/4 or 4/5 valve receivers, employing a conventional converter valve, like the 6J8-G or ECH35. The KFJB tuning unit is included as part of a complete foundation kit, comprising chassis, tuning unit, IF transformers and dial movement.

NEW LEAFLET DESCRIBES TRIMAX TRANSFORMERS

FOR many years Australian engineers in the communications field ave been handicapped in the design f new equipment or the improvement f old, by lack of complete data on udio transformers.

With this in mind, Trimax ransformers have announced the issue f leaflet 47-1, which is fully descrip-ive of their standard range of low evel high fidelity transformers. Due labor and material shortages, not ll types are in stock, but the object-e is "Delivery off the Shelf."

Every unit is guaranteed to have grequency variation not exceeding db from 30 to 10,000 cycles when sed under correct conditions. The ransformers are designed for use with secondary loaded. All types employ an astatic hum balancing structure with primary and secondary coils each in two separate sections.

Outer cases of mild steel or high conductivity non-ferrous metal give additional shielding. For particularly low-level operation, where freedom from hum pick-up is absolutely essential, special types are offered which, in addition to the above, incorporate triple shields of high permeability nickel iron alloy.

The transfer of longitudinal currents from primary to secondary is attenuated to a considerable degree by the provision of high-conductivity shields between windings.

"Trimax" transformers are obtainable through leading distributors in all States, but if difficulty is experienced, customers can contact the factory representatives, who can also give information on other associate lines:

Chandlers Pty Ltd., cnr. Charlotte & Albert-streets, Brisbane, Q'land.

Mr. L. B. Graham, C/- Radio Equipment Pty Ltd., 5 North York-street, Sydney, NSW.

Mr. C. N. Muller, Worando Buildings, Grenfell-street, Adelaide, SA.

Mr. R. D. Benjamin, 197 Murray-street, Perth, WA.

Messrs. W. & G. Genders Pty. Ltd.,
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Cathode Ray TUBES

Visually Portray —

- Modulation pattern (depth) percentages.
- Wave-form analysis.
- Distortion in various equipments.
- D.C. Voltage and A.F. voltage measurements.
- Frequency response.
- Observation of transients.
- Phase relationships of A.C. voltages.
- Frequency calibration.
- Faults in circuit analysis.
- Measurement of very short time intervals.
- Receiver selectivity.
- Null or maximum readings.
- Balance of push-pull amplifiers.
- Output versus input measurements on amplifiers.

PRICES OF CATHODE RAY TUBES

Type 5BP1 5" screen	£1/17/6
Type 4201 6" screen	£1/17/6
Type 4410 6" screen	£1/17/6
Type VCR516 12" screen	£1/10/-

(Plus 10% Sales Tax)

SPECIAL PRICE REDUCTION

Type 913 1" screen	17/6

(Plus 2/- War Duty)

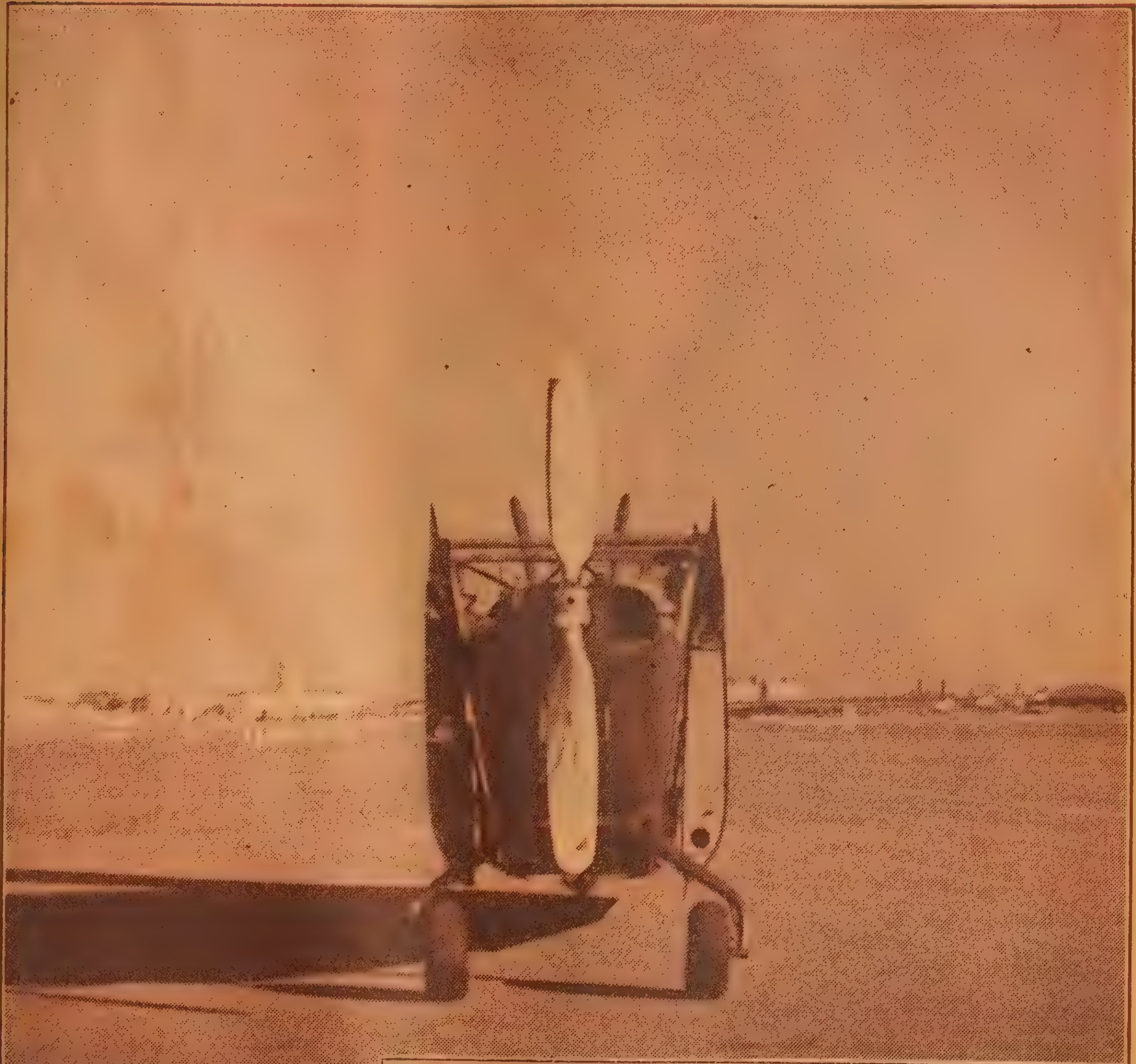
Transmitting and Miscellaneous Valves are now available:—

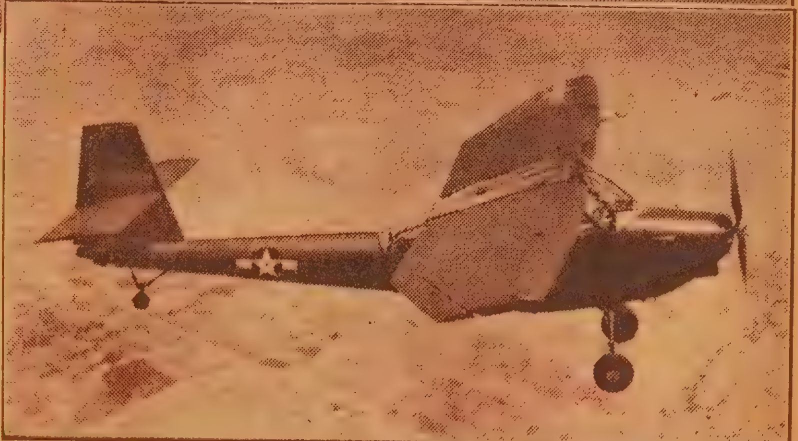
TYPE	
2C40	6.3 v. Lighthouse triode
2C43	6.3 v. Lighthouse triode
2E24	6.3 v. V.H.F. beam power amplifier
2V3G	2.5 v. H.W. high vacuum rectifier
3B25	2.5 v. H.W. gas rectifier
3C33	12.6 v. Twin triode
559	6.3 v. U.H.F. Lighthouse triode
808	7.5 v. Transmitting triode
814	10 v. Transmitting beam power amplifier
841	7.5 v. Transmitting triode
845	10 v. Transmitting triode
865	7.5 v. Transmitting tetrode
902	2" Cathode ray tube
956	6.3 v. Acorn super-control R-F pentode
957	1.25V. Acorn general purpose triode
958A	1.25 v. Acorn general purpose triode
1614	6.3 v. Beam power amplifier
1622	6.3 v. Beam power amplifier
1654	1.4 v. H.W. High vacuum rectifier
1801	9" Cathode ray tube
8013A	2.5 v. H.W. High vacuum rectifier
8020	5 v. H.W. High vacuum rectifier
8025A	6.3 v. U.H.F. Triode

Further technical information available on request.

AMALGAMATED WIRELESS VALVE COMPANY PTY. LTD.
47 YORK STREET (BOX 2516, G.P.O.,) SYDNEY

NEW STINSON HAS FOLDING WINGS





THIS new versatile Stinson L-13 army liaison plane demonstrates folding-wing advantages which make it possible to be hauled or towed by a truck or car over rough terrain or down a highway. The landing gear is adjustable with a tread of 92.53 inches for take-offs and landings and 61.6 inches for ground towing. It is equipped with unusually large flaps which aid it in take-offs to attain the air after a 230ft. run and to land at 43.7 mph in 227ft. Top speed of 115 mph, cruising 92 mph, will carry six and has a range of 370 miles.

STUDYING SECRETS OF SHOCK WAVE

The special equipment used to simulate supersonic shock waves sent out by high speed aircraft and pilotless missiles by towing models in one-quarter inch of water.

A quickening finger stretches towards Nature's barrier that has for so long prevented humans from travelling faster than sound itself. Machines fly within the air minus human pilots, others spitting flames roar upwards to hundreds of miles where the air is thin.

IN the same breath science dallies with the thought of man-made satellites or space ships to revolve around the earth in orbits many thousands of miles up.

With this straining of man's environment has arrived a new vocabulary of expressions—guided missiles, pilotless aircraft, pulse, ram, turbo, prop-jet, meteorites, rocket projectiles, velocity of escape, &c.

We are beset by a jargon of Tiny Tims, Wac Corporals, Wizz Bangs, Buzz Bombs, Bazookas, Gapas, Holy Moseses, &c.

Millions of pounds and dollars have been invested in the competitive race toward higher speed to break down this barrier and reach aviation's long-sought goal—supersonic.

Britain attempted to take it in one jump and in doing so lost one of its foremost test pilots, Geoffrey De Havilland.

With this tragedy in their minds British experts changed the nature of their supersonic investigations to radio controlled planes without human pilots.

American engineers are approaching the barrier along conservative steps and their research programme is cautiously inching forward.

TUNNEL TECHNIQUE

Lockheed Aircraft Corporation research scientists are using a method of studying flight characteristics of aircraft models in wind tunnels at any desired speed up to 850 miles an hour.

Several swept-back wing designs have been "flown" through the speed of sound in wind tunnel experiments, with lift, drag and stability being recorded progressively for the first time.

Since the wings may be used on future secret United States Army Air Force fighter planes, requirements of military security prevent any description of them beyond the statement that they embody the principles of "swept-back" construction.

Development of the Beman-Weaver "Bump"—a rounded, aluminium obstruction placed on the wind tunnel floor to produce a curved, speedier flow of air around the wing models—made the tests possible.

The "bump" was the discovery of Ward W. Beman, Lockheed's chief aeronautical research engineer, and John H. Weaver, Lockheed's wind-tunnel manager, and was made public only last month.

Supersonic wings have been designed in America and Britain and tested at speeds ranging from 2000 miles an hour, but data has never been obtained on them at and around the speed of sound due to extreme air turbulence which caused instruments to fluctuate.

THE "BUMP"

When experiments proved the value of the wind tunnel "bump", Lockheed moved its research to the 700 mile an hour Co-operative Wind Tunnel at the California Institute of Technology in Pasadena, California.

First tests in the new 12,000 horse-power tunnel gave readings of 580 miles an hour, or a Mach Number of 1.1.

Tests made of conventional high speed wings, including models of wings now being flown on present high speed aircraft, have shown definitely that supersonic flight is impossible with these designs.

Solid brass models of conventional design broke up under the terrific shock waves of compressibility in the supersonic wind tunnel.

North American Aviation research engineers have contributed to the race with a simple technique of towing models through a water channel to simulate the supersonic shock created by high speed aeroplanes and guided missiles.

Speeds up to 7000 miles per hour can be simulated by towing models through a water channel filled to a depth of only one-quarter of an inch.

TOWING METHOD

The engineers tow a model representing a supersonic wing, a ram jet or similar components through the channel by means of a wheeled stand.

The wheel holds both the model and the camera which records the shock wave patterns sent out by the models.

Wave patterns created by models being towed through the shallow channel are similar in shape to the shock waves sent out by a body flying through the air at supersonic speeds.

It is possible to simulate an aerofoil at a speed of 3000 miles an hour—

four times the speed of sound in the air.

The model is towed through the water channel at a velocity of 3.6 feet per second, which is four times the velocity of water waves in a channel one-quarter of an inch deep.

The velocity of sound is thus replaced by the velocity of the water waves.

Dr. William Bollay, head of the North American Aviation's aerophysics laboratory, points out that the water-channel system is less expensive than supersonic wind-tunnel tests, and also can be used to simulate accelerated motions.

The disadvantage, he said, is that the resulting data are not accurate as wind-tunnel tests, but are primarily useful for qualitative studies of supersonic flow.

The technique of using the analogy of water waves and shock waves in the air was first proposed in America by Theodore von Karman, of the California Institute of Technology, for the reverse problem of studying the optimum design of water channels for the Los Angeles Country Flood Control District from the well-known theories of supersonic flow of air.

ROCKET TRAVEL

North American Aviation's aerodynamicists are now working in the opposite direction — going from the experimental water channel to deduce the supersonic flow air.

Speaking before the National Aviation meeting of the American Society of Mechanical Engineers, Mr. E. H. Heinemann, chief engineer of the El Segundo plant of Douglas Aircraft Company, predicted that although rocket missiles may be fired to any point on the earth within the near future, everyday rocket travel appears to be remote.

In a paper entitled "High-speed Aircraft Development," the engineer said that from data presented and recent news, one might be led to the conclusion that rockets will be the next mode of high-speed travel.

"The development of rockets as uninhabited missiles capable of being fired to any point on the face of the earth appears to be within the realm of possibility in the relatively near future," Heinemann declared.

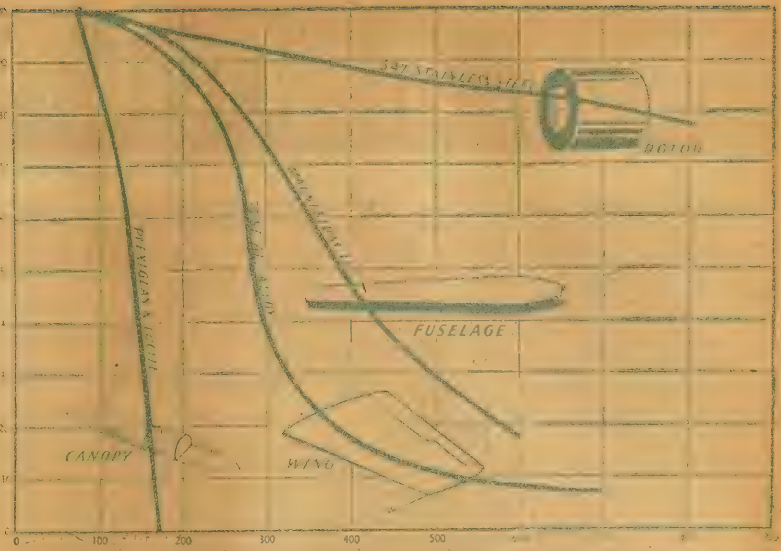
"The greatest unsolved problems in this field are generally considered to be those of obtaining satisfactory guidance and control.

"Since rockets operate most efficiently above the earth's atmosphere, the problem of using them for human transportation is somewhat more complicated, due to the necessity of reentering the atmosphere at several thousand miles per hour and landing safely.

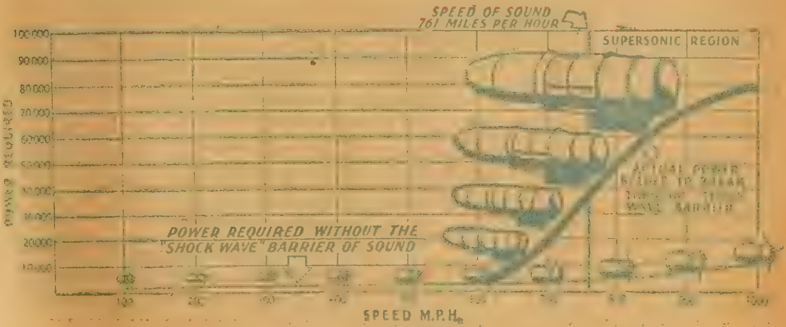
The Keystone or Treaty oak at Jacksonville, Fla., is so large that 4000 persons can stand in its shade at noon, it is estimated.

★ ★ ★

New fountain pen *ink* writes dry by vertical penetration into the paper and not by evaporation or drying of the solvent, the makers claim.



Speed does things to the materials of which aeroplanes are built. The figures on the left illustrate the percentage of strength retained by the different materials as speed—and with it temperature (the figures along the bottom) increase. Plastics are the first to go, stainless steel the last. Components of the Douglas Skystreak made from the materials shown demonstrate how different parts of the plane will stand up.



The above chart shows what happens to power requirements approaching and crossing the sound barrier. The red line and huge jet engines illustrate the sudden surge of 80,000 horse-power needed to break through the barrier and beyond. Smaller propeller engines illustrate the normal rise in needed power if the shock wave barrier had not been there.

Model of the wind tunnel using the "bump."

PICTURE NEWS OF THE WORLD'S SKYWAYS

New British Engine

A 160-HORSEPOWER, flat six-cylinder engine, especially designed for installations submerged completely in the wing has been designed by Roy Fedden, Ltd., a British firm, and will go into production shortly.

Conceived with light plane pusher types in mind, where the propeller would be driven by an extension shaft, the engine is 14 inches high, 31in. wide and 34in. long.

The manufacturer is a newcomer to the British aircraft industry, being founded last year by Sir Roy Fedden, wartime principal technical adviser to the Minister of Aircraft Production, and president of the Royal Aeronautical Society.

An aircooled, horizontally-opposed four-cycle engine, the "Fedden Flat" has a two-piece aluminium crankcase with cylinders of low expansion silicon alloy and sleeves of nickel manganese chromium alloy high-expansion steel. Fuel system employs direct injection, rather than carburetion.

Brabazon Contract

ARMSTRONG-WHITWORTH AIRCRAFT CO., LTD., has been awarded a contract to build the Brabazon II British transport.

It will be a low-wing monoplane with tricycle landing-gear, designed to carry 24 passengers on a long haul or 40 on short hops.

It will be powered by four Mamba gas-turbine prop jets, and have a range of 1000 miles at better than 300 mph, with a gross weight of 35,000lb.

Fuselage interior is to be pressurised and air-conditioned.

A.N.A. Figures

STATISTICS on freight figures reached by Australian National Airways for the financial year ended June 30, 1947, totalled 18,645,518 lb.

For the six months ended December 31, 1946, ANA carried 8,891,240 lb., and for the six months ended June 30, 1947, 9,763,278 lb.

Compared with freight traffic of 7,705,221 lb. for the nancial year 1945-1946, the 1946-1947 figures showed an approximate increase of 14 per cent.

These figures are equivalent to 8328 long tons and equals an average monthly turnover of 1,554,543 lb. gross weight per month.

The highest monthly poundage for the year was handled in the month of May, when Australian National Airways freighted just over 2,000,000 lb. gross weight for the month.

British Jets Lead

RAF Group-Captain Frank Whittle, reporting in Britain on his American lecture tour, said American jet-engines are currently about two years behind British models in basic developments, but overhaul periods were amazingly lower (50 hours for American jets, compared to 270 for British engines).

The RAF will scrap all reciprocating-engined fighters in its operational squadrons as soon as sufficient jet-powered fighters are available for replacements.

Atom Power For Planes

WITH a primary contract going to the Fairchild Engine and Airplane Company, the United States Army Air Force has undertaken a research programme to ascertain how atomic energy can be harnessed as the propulsive power for future military aircraft.

While it is technically feasible now to use atomic power for aircraft propulsion, the airplane would have to be so big—three or four times heavier than the 278,000 pounds B-36—that such a development will not occur within 10 years, Dr. Luis Alvarez Robert J. Collier Trophy winner, recently told the Aero Club of Washington, USA.

Major-General Curtis Le May is in charge of the USAAF's research programme.

Although Major-General Le May has said nothing beyond the fact that research will be conducted at Farmingdale, NY, he has inferred that preliminary results prove that atomic air power is "not impracticable" even though the engineers are still seeking a final method for utilisation of nuclear energy in aircraft.

U.S. Fighters

THE United States Army Air Force is thinking in terms of three types of future fighter planes: A penetration fighter to accompany long-range atom bombers; an all-weather, for use at night and under conditions where visual contact is impossible; and a short-range rocket-powered interceptor.

The bulk of the new order is for an undisclosed additional number of Republic's new P34 Thunderjet's, first American jet-fighter plane to exceed 600 mph.

Republic Aviation Corporation has received new military aircraft order totalling more than 25,000,000 dollars according to an announcement by the United States Army Air Force, Air Material Command.

At left: Latest photograph of the world's largest land-based aircraft, the six-engine XC-99 cargo and troop transport being built by Consolidated Vultee Aircraft Corporation for the United States Army Air Force.

The giant double-decked plane, capable of carrying 400 fully-equipped troops or 100,000 pounds of cargo, is now nearing completion at San Diego, California.

The AAF has revealed that the XC-99 will have a maximum range with reduced loads of more than 8000 miles. Flights of this distance will call for a five-man crew and an equal number of relief crew members.

The plane, transport version of the Convair B-36 bomber, is 182½ feet long, 57½ feet high and has a 230-foot wingspan.

Allison Jet Engine

THE Lockheed P-8AR which held the world's speed record for 623.8 mph was powered by America's highest powered jet engine with a top rating of more than 4600 pounds.

Designated the Allison Model 400, this jet engine is of the same general type as the production AAF J33-21 engine, which powers production models of the P-80 Shooting Star.

Late this year, Allison will put this model in production for a new production series of the Lockheed P-80.

Performance data on the new engine, all of which have been exceeded in test stand operations are:

Take-off power (dry), 4600 pounds static thrust.

Military power, 4600 pounds static thrust.

Maximum continuous power, 3600 pounds static thrust.

Military power S.F.C., 1.13 pounds/pound thrust/hour.

Maximum continuous power, S.F.C. 1.12 pounds/pound thrust/hour.

Cruise S.F.C., 1.14 pounds/pound thrust/hour.

Engine weight, 1735 pounds.

RR Made In China

ROLLS-ROYCE, Ltd., has concluded an agreement with the Chinese Government under which Rolls' jet engines will be manufactured in China.

Chinese engineers are supervising the construction of a plant in China.

This is the second notable foreign licensing agreement in which Rolls-Royce has figured recently, having previously licensed a private US firm, Taylor Turbines.

Underwater Aircraft

THE United States Navy conservatives are questioning feasibility of a submersible plane idea now being tested in model tanks by Navy technicians.

The project requires a plane built strongly enough, so it can land on sea, submerge to escape pursuit or ambush some surface craft, and then take off to continue flight.

The "underwater aircraft" would be powered with jet engines in the air, and air vents would close automatically when the plane struck the water.

An auxiliary power system would be used underwater.

Packard Turbo-jets

DEVELOPMENT of a new type of turbo jet engine which has operated successfully on a test stand, has been announced by the Packard Motor Co. of America.

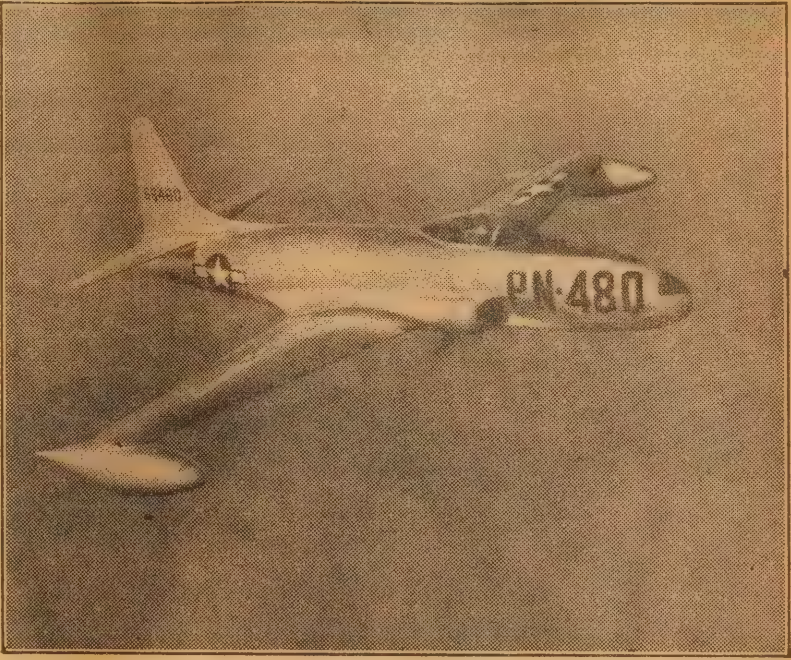
President of the company, Mr. George T. Christopher, said the engine will remain on the restricted list until it goes into production later this year.

Packard is engaged on the project at Toledo, Ohio, under an agreement with the Air Material Command of USAAF.

At Toledo Packard has built a new 500,000-dollar turbo jet laboratory which is scheduled for completion this month.

It will include facilities for testing jet engines, and parts, in temperatures as low as 70 degrees below zero, and at altitudes up to 42,000 feet.

LATEST U.S. JET FIGHTER PLANE



This is the first photograph of the United States Army's new Lockheed P-80B "Shooting Star" jet propelled fighter now in production at the Lockheed Aircraft Corp. factory in Burbank, California. There are many improvements on the P-80A—note the extended dive flaps below the plane to slow it down to the speed of the accompanying camera plane. Faster firing guns have been installed and the aircraft has been given more resistance to battle damage. The airplane is delivered with an unpainted, shiny aluminium surface, since earlier P-80's which flew into rainstorms at high speed emerged with paint chippd off. A pilot ejection seat has been added and radio masts and antenna wires have been enclosed in the pilot's canopy for the first time on any aircraft. The P-80B is believed to have the greatest fire-power of any jet fighter in the world.

Fate Of Wright's Plane

THE first powerplane to fly, the historic biplane which Orville Wright lifted from the sands of Kitty Hawk, nearly 44 years ago, may be expected to remain in England indefinitely, until a suitable place is designated for it in America.

Sources close to Orville Wright, recently reported that the 75-year-old co-inventor of the first successful aeroplane, contrary to recent and recurring reports, has made no definite plans for the plane's early return to America.

He intends to take it back—but not until he is satisfied with the arrangements made for its exhibition.

In 1942, the Smithsonian Institution promised that if the plane were brought back it would have "the place of highest honor which is its due."

Presumably this would be in the New National Air Museum recently authorised by Congress.

Swedish Speed

SVENSKA Aeroplan A.B., Swedish aircraft manufacturers, are working on a new fighter type designed to outfly the British Gloster Meteor.

Prototype is expected to fly by the end of this year.

This new model known as the SAAB R1001 will have sweptback wings and a planned top speed in excess of 650 mph.

New Bomber

THE US Navy's new four-engine patrol bomber, the Martin XP-4M-1, made its first test flight recently.

Principal feature of the new plane is its top speed of 398 mph, and its unique engine installations, which have a Pratt and Whitney R-4360-4 reciprocating engine and a General Electric I-40 jet in a single nacelle.

Service ceiling is 16,400ft. and gross weight 81,887lb.

Fast Haul

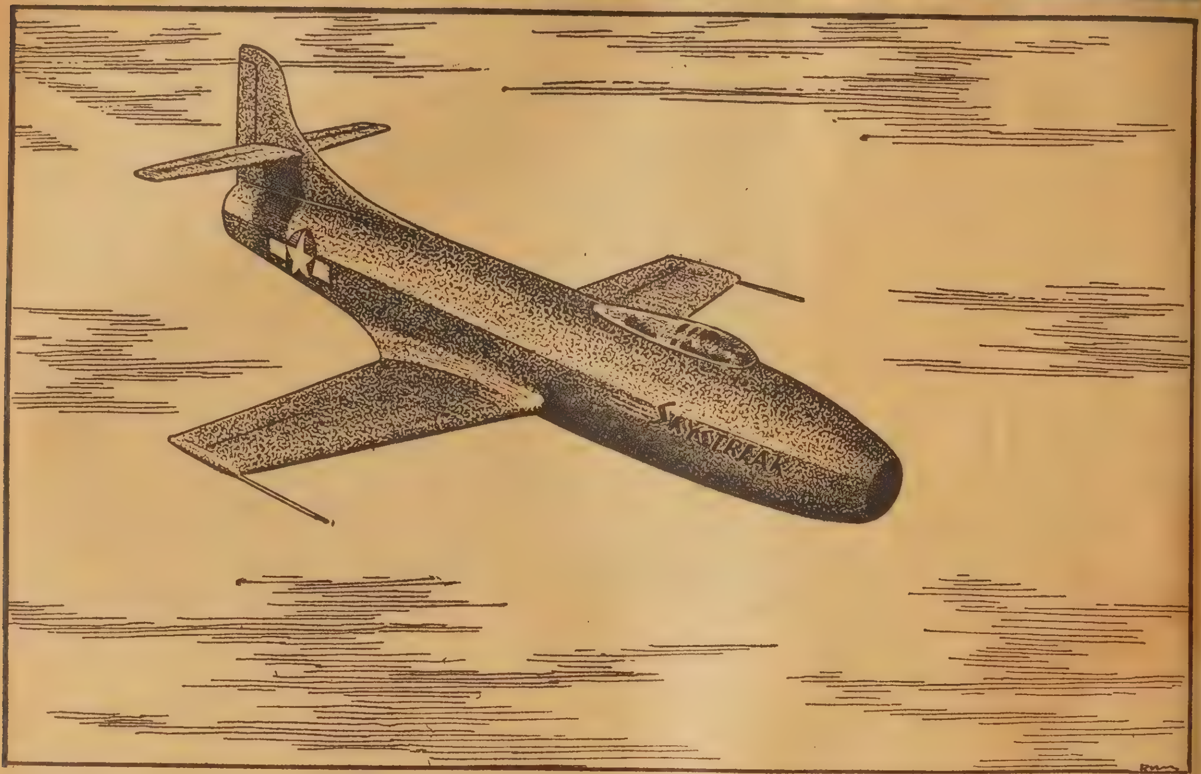
A UNITED STATES Army Douglas XA-26F, powered by a combination of two Pratt and Whitney Double Wasp "C" engines and one General Electric 1-16 jet engine, set a new international speed record recently of 413 miles an hour over a 1000 kilometre course with a 1000 kilometre payload.

The plane, piloted by Lieutenant-Colonel T. P. Gerrity, flew the round trip from Wright Field and St. Louis in one hour, thirty seconds.

The previous best world's time for the distance with a similar pay-load was 369 miles an hour, established by a US Army bomber in May, 1945.

Otters sometimes take over burrows dug by muskrats or beavers, some naturalists claim.

DOUGLAS SKY-STREAK BREAKS RECORD



Designed to probe the secrets of the trans-sonic speed range, the US Navy's experimental single-seat "Skystreak" has set up a new world speed record of 650.6 miles an hour.

THIS turbo-jet, piloted by Marine Major Marion Carl, covered four runs at an average of 650.6 miles an hour. A week earlier the same plane, piloted by Commander Turner Caldwell, had set up a record when it averaged 640 miles an hour. Its fastest run on that occasion was 653.4 miles an hour.

Designated the D-558, the Skystreak is a small, finely-streamlined low-wing monoplane, with clipped wings. In its record-breaking runs it was fitted up as a "flying test-tube," carrying 500lb. of recording instruments.

The air intake for the jet is in the nose, and the air is ducted to the turbine located behind the pilot's cabin.

The tailplane is placed almost halfway up the tail fin.

In its record runs the Skystreak approached the speed of sound. At sea level the speed at which sound travels through the air is 765 miles an hour; at higher altitudes, because of lower temperature and air densities, the speed is below 700 miles an hour.

Design of aircraft parts for planes that are to reach such speeds must be adapted to meet the special conditions. The wings of planes designed for trans-sonic and supersonic (faster-than-sound) ranges must be swept back slightly and are thinner in section than those of normal speed planes.

This is because in flight at or near the speed of sound, air fails to flow over the wing in the way it does at subsonic speeds. Instead, the air builds up into a phenomenon known as "compressibility," which is a wave of air that is as "solid" as a brick wall.

This "shock wave" spoils the lift of the wing, resulting in loss of control. It can start up a battering process that may actually tear the aircraft wing to pieces.

Jet propulsion has been instrumental in bringing aircraft speed ranges into the realm of "trans-sonic" and "supersonic" speeds.

Spectacular advances have come since the perfection of jet propulsion, first announced in 1944. "Jets" have been responsible for raising flying speeds beyond 500 miles an hour—which is about the limit for propeller-driven planes.

The Skystreak has added to the achievements of jet propulsion and taken it one step further in fulfilling the hopes held out for it as a propulsion system. Further experiments being undertaken with the Skystreak will open the way for ultimate in speed by jet propulsion, after which rocket power will take over.

It is believed that jets will take speed range beyond 700 miles an hour, after which rocket craft will carry on to limits that appear to depend only on the strength and durability of the aircraft and the power of the human being to stand the hazardous conditions.

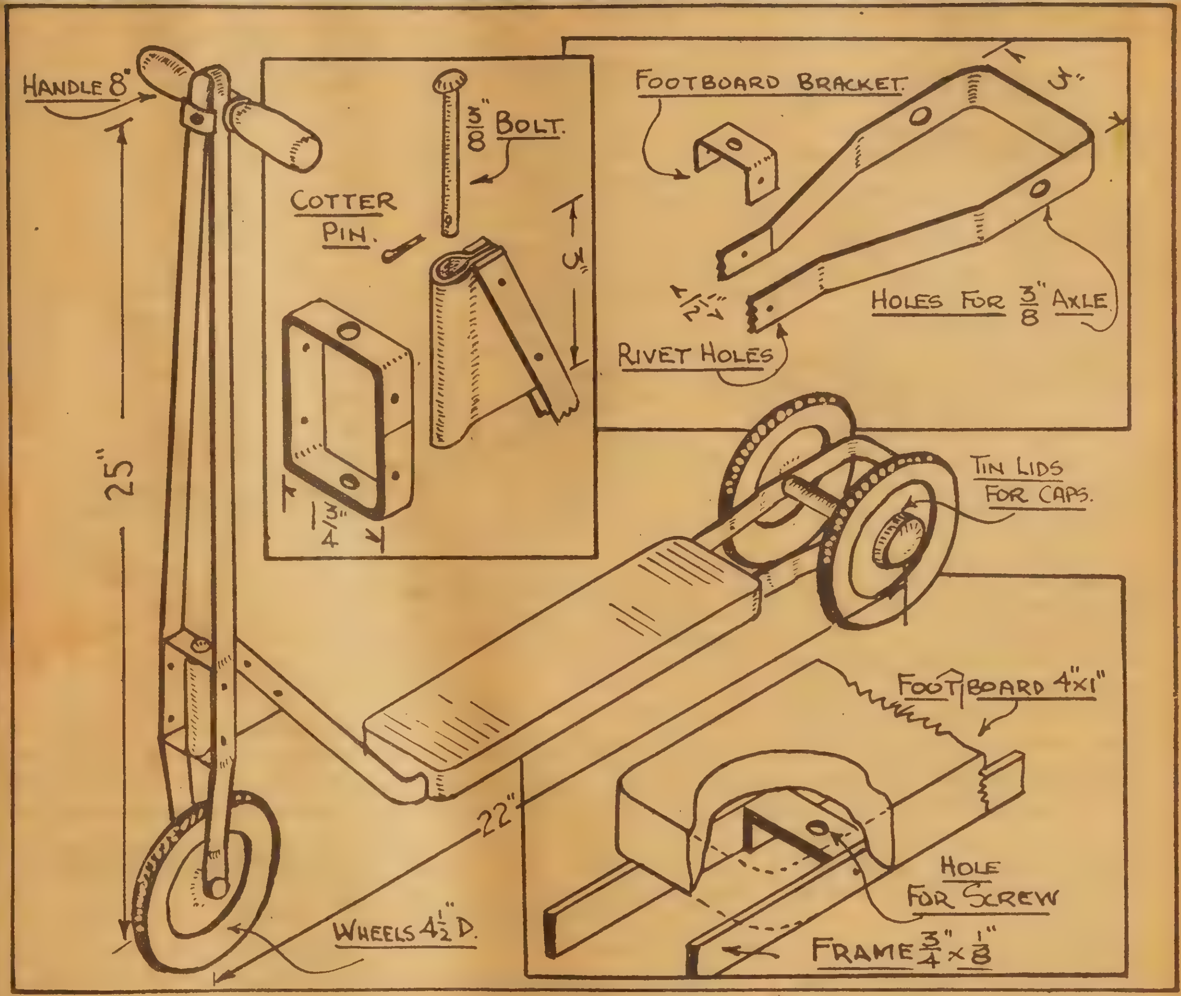
The Australian Short-Wave Handbook

OUR new handbook—actually the 1947 edition of our old Call-Sign Book—will be on sale some time during October.

It will be something new for Australia. In addition to printing Australian and New Zealand amateur station call signs, all the short-wave stations of the world will be listed. More than half the pages will be devoted to technical and constructional articles describing short-wave receivers, transmitters, modulators, &c. including circuits for UHF work and a slashing new short-wave set.

There will be about 100 pages, and the price will be only 2/- — available everywhere or post free from our office, 60-70 Elizabeth-street, Sydney.

MAKING A THREE-WHEELED SCOOTER



A scooter rather unconventional in design, that is one with three wheels instead of the usual two, is much easier for the small child to handle whilst still in the stage of learning to use such simple aids to walking. The ease with which it is balanced coupled with its lightness and strength will make it a delightful acquisition to the small boy's playthings.

by T. E. Le Sueur

As can be seen from the illustration, the design is straightforward, the chief parts being made from strips of ¾in. x 1-8in. flat mild steel. These are readily bent to shape and when the various pieces are riveted together they make a very strong construction.

It does not matter much which piece of the scooter is made first, but suppose we start with the front forks. For these, a strip of steel is needed the approximate length being 52in Measure to the centre from end to end, and mark the position with a piece of chalk. Then bend the strip double across a length of small-diameter pipe. This will make the top of the forks nicely rounded.

Afterwards the two arms can be cut off to equal length. Mark out all of the holes needed here and drill them through the two arms, thus making sure that the holes will be opposite each other. Those for the front axle are ½in from the ends, whilst those to hold the hinge bracket are 1½in apart and 4¾in from the centres of the axle holes.

After the holes are drilled, the forks can be bent to a suitable shape, an indication of which is shown in the sketch, and then rivet the hinge bracket in place. This bracket is made from a piece of strip steel and is bent to the shape of a rectangle, 3in x 1¾in, with the join coming in the middle of one of the long sides. Along the short sides centre punch the positions for the hinge-bolt holes, and drill them 3-8in. Then mark out the position of one side rivet hole, drill it and rivet the bracket in place. The remaining three holes can now be drilled quickly and accurately. with the assurance that the rivets will fit without any trouble.

The next large part needed is the bottom frame, and for this 50in of the material is required. Measure 25in from one end to find the middle, and come 1½in on either side of this, thus marking the position of the two 90 degree bends for the back. As before, form the frame around a piece of pipe to make nicely-rounded curves, then cut the arms to length, if they are unequal. Now a strong vice and

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some patience is required for the neck of the frame must be bent up at an angle to take the hinge flap. Hold one arm of the frame flat in the jaws of the vice, say, about 8in from the end, and very carefully exert pressure until it bends. (A piece of pipe slipped over the end will give extra leverage.) Watch the bend carefully, and if it tends to buckle, take it from the vice and flatten it out with a hammer. Continue these steps until the neck reaches up to the hinge bracket, which has previously been riveted in place in the forks. The exact angle for the bend can be tested on the job itself. When one arm is correct, bend the other to the same angle. Drill two holes in the neck, 1½in apart from the rivets.

HINGE FLAP

The hinge flap requires a piece of heavy sheet steel, 6in x 3in. Fold it in two around a 3-8in bolt, then squeeze it together in the vice to form the shape desired. Hold the flap temporarily in place in the frame, and, after making sure that it is set correctly, mark out and drill the holes and rivet this piece in place. Any excess metal left protruding can now be cut off with a hacksaw, and the rough edges smoothed up with a file. The arms along the centre of the frame must now be made parallel, to take the woolen footboard. The rear end of the frame is bent to a shape approximating that in the plan, whilst the front being riveted together tapers up smoothly. Use a vice and hammer for this.

Two small footboard brackets are also needed and these are made from pieces of strip steel, 3in long. Drill three holes in each of these, then bend them into a U-shape, so that the distance between the two bends is 1½in. Drill holes in the frame and rivet the brackets in place.

The footboard is a piece of wood 4in x 1in x 13in, and is screwed in place from underneath by two screws. Before assembling, plane up the edges and carefully round the corners. The 8in handle can be turned on a lathe or worked by hand to the shape desired. It is held in place by means of a small bolt and clip. If a groove is filed in the back edge of the forks, the handle will stop rigidly in place.

WHEELS

Wheels can be bought, but if made the cost will be much less. Three of these wheels, 4½in in diameter, are needed, and when turning them on the lathe, recess a groove around the rim to take a ½in rubber tyre. The centre bearing will have to be reinforced and the best way to do this is to drill the hole oversize, say, about ½in, and bush it with a piece of 3-8in inside diameter brass tube. The ends of the tube can be burred over to keep it in place. Aftr the wheels are tyred, they can be adjusted on the scooter.

The front wheel is on a short 3-8in axle, the ends of which come through holes previously drilled in the ends of the forks and are then riveted over. Washers may be necessary to take up any slack, and don't forget to put these on before fastening the axle in place. The rear axle of 3-8in rod is somewhat longer, but it also, after passing through the holes drilled in the frame and the wheels, has the ends riveted over (or, if desired, small holes may be drilled and split-pins used instead).

AXLE ENDS

It is advisable to cover the axle-ends on the rear wheels with a protecting cap of some sort. Two powder-tin lids or similar will be useful here. Drill two holes through the lids to take small screws and fasten them securely in place. File off any rough edges on the screws. A 3-8in bolt is dropped through the hinge and fixed in place, with a nut or a cotter-pin to hold the frame and the forks together. After painting and oiling, the scooter is ready for use.

The Australian Short-Wave Handbook

OUR new handbook—actually the 1947 edition of our old Call-Sign Book—will be on sale some time during October.

It will be something new for Australia. In addition to printing Australian and New Zealand amateur station call signs, all the short-wave stations of the world will be listed. More than half the pages will be devoted to technical and constructional articles describing short-wave receivers, transmitters, modulators, &c. including circuits for UHF work and a slashing new short-wave set.

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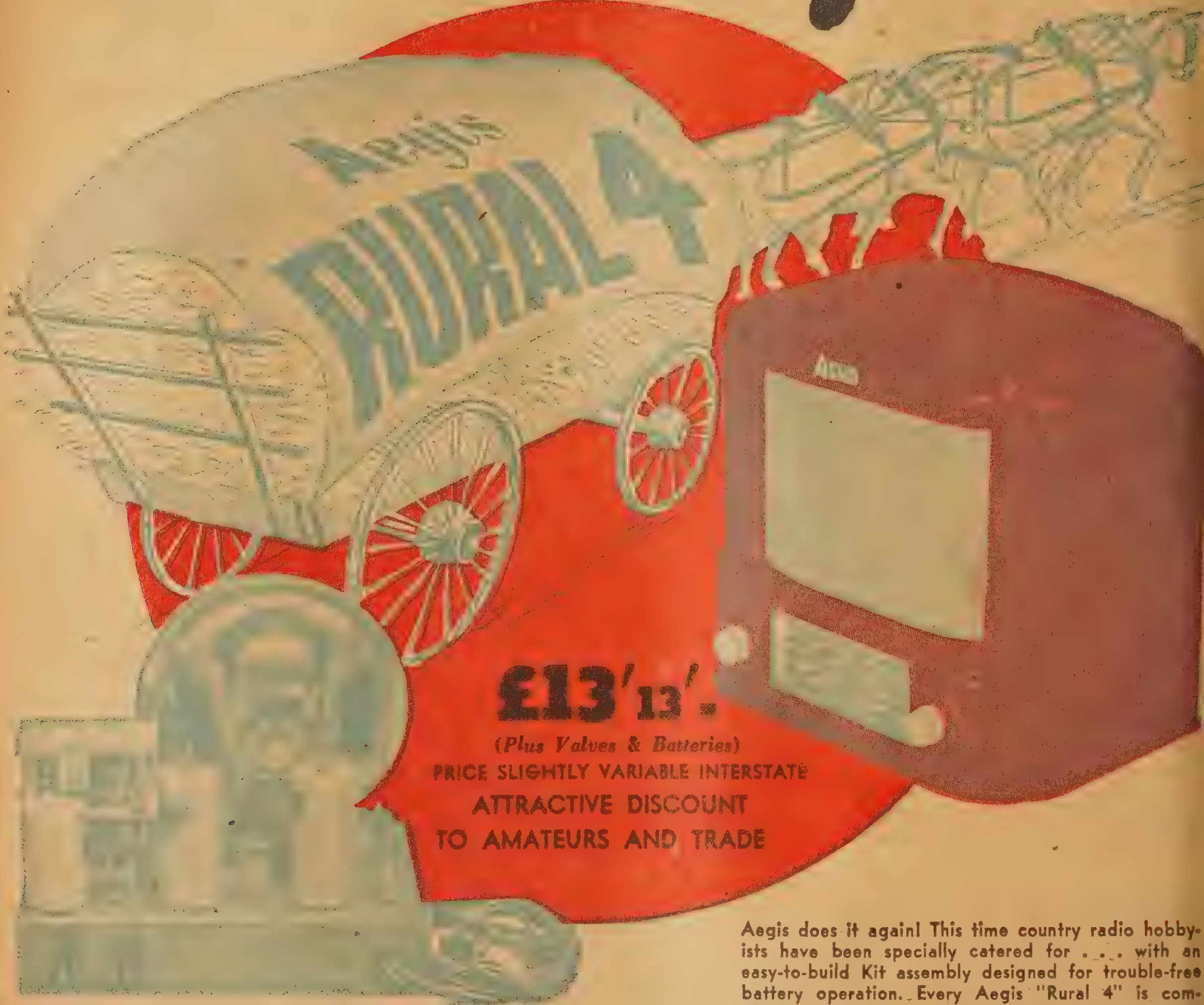

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"HANDIE-TALKIE" — *Continued*

from Page 33

eeves of the sockets to A-minus or a convenient earth point. If you n't, the set will be hopelessly un- able.

For ease of wiring we suggest that u use plastic hook-up. Cut each ad to the exact required length, trim e tip of the insulation with a sharp nife or razor blade, and solder quick- and cleanly. If you let the wire t too hot, the insulation will recede, aving the wire bare.

Finally, connect the filament circuit rough to the off-on switch, and, if u have a voltmeter handy, connect a 1.5 volt cell and check the voltage ross the filament pins.

The 3S4 valve has a centre-tapped ament, which can be operated from ther a 1.4 or 2.8 volt supply. We use e parallel connection in this set, so at pin 5 becomes filament minus and earthed. Pins 1 and 7 are bridged ross and connected to A-plus. In- dentally, we wired the switch as own in the circuit to allow one side it to be earthed. This lends itself possible switching schemes worked the opening and closing of a door the cabinet. A small point, but possible future value.

ANSFORMER CONNECTIONS

Next step is to put in the other ads, including the high-tension wir- g and the plate and screen leads the IF amplifier.

Be very careful about the connec- ons to the IF transformers, as re- ersal of the windings makes an ormous difference in the gain of the ceiver. In the transformers used the original set, the B-plus con- ction was indicated by a small rub- r sleeve around one pin. The other n of the same winding is obviously ate, while the grid pin is alongside —not in the opposite corner. Other idget IF transformers may not em- oy the same connections, but the int is mentioned because it is vitally portant in terms of gain.

If there is any danger of the lugs orting to the chassis, slip a length spaghetti tubing over them to re- ove this danger.

The wiring components can now be ded, and, to facilitate duplication the original set, we have coded each ndenser and resistor in the circuit d marked its position in the under- ath photograph. In a tiny set of is type, it is almost impossible to aw a wiring diagram, but the care- lly marked photographs and the cket connection diagrams should be considerable assistance.

SE SMALL COMPONENTS

Once again, we must stress the ab- ute necessity of using midget com- nents. It would be practically im- ssible to fit into the available space istors and condensers of the normal e.

As previously mentioned, avoid aining the connecting lugs exces- ely or bending them at the point junction with the component. Work h a pair of sharp-nosed pliers, or n a pair of tweezers. Bend and snip the leads to the right shape, slip a length of 1-mil. spaghetti tubing over them and solder carefully in place.

The AVC bypass condenser, C3, can be mounted vertically in the corner between the gang condenser and the 1R5 converter. If you use a small scrap of resistor strip to anchor it in place, it makes a handy junction point for the AVC lead to the loop aerial.

The only other small component mounted above the chassis is the 1S5 grid bypass, shown as C12. This can be mounted directly between the appropriate pins on the volume control, where it will just clear the alignment of the front and edge of the chassis.

There is no need or space for shielded wire, but the short length of all leads and the layout adopted did not allow for any trouble with instability.

Having completed the wiring, assemble the speaker and transformer to the chassis and wire into circuit. We earthed one voice coil connection and used the lug as an earth point for the trimmer across the front or aerial section of the gang. The trimmer should be mounted clear of the rotor plates and accessible to screwdriver adjustment when the set is installed in the cabinet. The proximity of batteries and the chassis to the loop has some effect on the alignment.

No variable trimmer is shown on the oscillator section of the gang. Actually, after the photograph was taken, we wired a 10 mmfd ceramic fixed condenser across the oscillator section of the gang, and this allowed a nice peak to be obtained on the aerial trimmer. With a purely numerical dial scale there is no need to worry about calibration, and the fixed condenser is naturally much smaller.

PADDER CONDENSER

Further to conserve space we used a .0004 mfd fixed condenser for the main padder capacitance, shunting it with a small trimmer for adjustment purposes. Even if a further midget condenser has to be added in parallel the resultant combination is far smaller than the usual variable broadcast padder.

The loop aerial is bolted or screwed

Continued on Page 87.

Engineering offers so many opportunities today that the young man who is mechanically minded hardly knows in which direction or in what branch of Engineering to turn his attention.

One recommended branch is MOTOR CAR ENGINEERING.

Another recommendation is DIESEL ENGINEERING . . .

We are again making a very special offer of training students—by Correspondence . . . you owe it to your future to get the facts!

MOTOR-CAR ENGINEERING

Since 1923 THE AUSTRALIAN TECHNICAL SCHOOLS, 3 Jamieson Street, Sydney, have trained students by CORRESPONDENCE in Engineering subjects with MARKED SUCCESS.

Learn how to Fix it!

HERE ARE A FEW EXTRACTS FROM STUDENTS' LETTERS, which speak for themselves:—

"I must thank you for helping me. Since getting my certificate my wages have been over £8 per week."

"I must congratulate you on the way you put me through the Motor Course. I have been able to secure a first rate job with the largest garage here."

"It is thanks to your Motor Engineering Course that I am now in the position I hold as Chief Mechanic."

"Thanks to your technical training, I have a good position as Chief Mechanic on a station."

"Eight years ago one of my sons successfully completed your Motor Engineering Course. He then opened his own garage, and has done well. I now wish to enrol two more sons."

"You have done more for me than I can put into words. When I enrolled I was just a Farm Hand. Now I own my own garage."

"I have been appointed Service Manager for the International Harvester Co., for the Northern District.—I thank you."

POST COUPON FOR FREE BOOKLET

ALL ABOUT MOTORS

GET THIS FREE BOOKLET

The Supervisor (R.H.), 1047
AUSTRALIAN TECHNICAL SCHOOLS,
Assembly Hall, 3 Jamieson St., Sydney.

Please send me, without obligation, your FREE BOOKLET, "All About Motors," giving details of your CORRESPONDENCE COURSE in MOTOR CAR ENGINEERING, and Special Offer.

Name ....

Occupation .... Age ....

Address ....

SHORT WAVE NOTES BY RAY SIMPSON

N.Z. STATIONS TESTING ON S.W.

NOUMEA AGAIN CHANGES FREQUENCY

For a long time now Australian listeners have been looking forward to the opening of the New Zealand short wave stations and at last it appears that they have commenced preliminary testing. In one of the DX sessions from Radio Australia it was announced that Wellington had been heard testing from 7 pm to 8 pm from stations ZL2 on 9540 kc and also ZL3 on 11780 kc.

AT time of writing, we have had no reports from listeners as to these tests being logged in this country, and we did not hear them ourselves. Listeners should watch these frequencies, however, as further tests will surely be made.

READERS' REPORTS.—Owing to altered times of going to press, and the later publishing date of the magazine, it will be impossible to acknowledge all letters intended for this issue, but these will be dealt with in the following issue. Readers should, therefore, note in each issue when reports are required for the next two months' issues, so that they will be in time to ensure their inclusion.

Over three weeks elapse between the time these notes are handed in and the date the magazine is on sale in Sydney.

SYDNEY GET-TOGETHER.—There has not been sufficient time to receive replies to our paragraph in the September issue concerning the proposed meeting of Sydney listeners, so it will be impossible to fix any date for this function at this time. When sufficient replies are received the writer will drop a postcard to all listeners who will be able to attend, advising them of the date and location.

A good night should be had by all those able to be present, and an opportunity made to get better acquainted with each other. Bring along a few of your best verifications and let the other chaps see what success you have had.

RADIO FRANCE, HANOI.—Just as we write these lines we have logged this station on a new frequency of 6055 kc in the 49-metre band. This frequency appears to be instead of the one they were formerly using, 9465 kc. At 10.0 pm a male announcer gives the news in English, and at the end of the news, at about 10.15 pm, gives their frequency as 6058 kc, and invites listeners to tune in again.

Another Indo-China station, Radio Vietnam, has also been heard lately, first on 12020 kc, and latterly on 11920 kc, but as the quality of transmission is very poor indeed, it has been hard to get any details beyond the fact that they also give news in English at 10.0 pm.

PIETERMARITZBURG NOW USING 4878 KC.

WE have just received advice direct from the South African Broadcasting Corporation that Pietermaritzburg is now on the air using a frequency of 4878 kc at the following times, 2.45 pm to 4.30 pm, 6.15 pm to 10.10 pm, and midnight to 7.05 am, using a power of 500 watts. We do not seem to remember having had any report of the reception of this station before, so here is a chance for someone to log it, which should be possible in the early hours of the morning, and possibly till as late as 6.0 am, or a little after. Perhaps by the time our next issue is out we may have had definite word of someone hearing it.

SHORT wave notes for the November issue are due on October 4th. For the December issue they are due on November 1st. Please send them direct to Mr. Ray Simpson, 80 Wilga Street, Concord West, N.S.W.

READERS' REPORTS

THE following readers have written us regarding stations they have heard during the past month.

Mr. A. D. Addis, Ascot, Q'land.; Mr. M. Foster, Mount Vincent, NSW; Mr. T. R. Boyd, Ripponlea, Vic.; Mr. W. G. Leeming, Alphington, Vic.; Mr. G. A. E. Major, Manjimup, WA; Mr. R. K. Clack, Punchbowl, NSW; Mr. P. Kayser, West End, Q'land.; Mr. A. W. Harris, Benalla, Vic.; Mr. H. R. Cox, Cobden, NZ; Mr. F. J. Smedley, Landsborough, Q'land.; Mr. Art Cushen, Invercargill, NZ; Mr. Rex G. Gillett, Prospect, SA; Mr. W. R. Holland, Canterbury, Vic.; Mr. R. Rooke, Manly, NSW; Mr. R. O. Block, Petersham, NSW.

NEW STATION LOGGINGS

Call	*KC*	*Meters*	*Location.*	*Time heard*
Radio France	*6055*	*49.55*	*Hanoi, Fr. Indo China.*	*10.00 pm*
Italian	*7250*	*41.38*	*Italy.*	*6.30 am*
Luxembourg	*9527*	*31.49*	*Luxembourg.*	*4.00 am*
ZL2	*9540*	*31.45*	*Wellington, N.Z.*	*7.00 pm*
Singapore	*9690*	*30.96*	*Singapore, Malaya.*	*10.00 pm*
OTC5	*11645*	*25.76*	*Leopoldville, Bel. Congo.*	*7.00 am*
WGEA	*11770*	*25.49*	*Schenectady, N.Y., U.S.A.*	*8:00 am*
ZL3	*11780*	*25.47*	*Wellington, N.Z.*	*7.00 pm*
Manila	*11840*	*25.34*	*Manila, Philippines Is.*	*7.00 pm*
Radio Vietnam	*11920*	*25.17*	*Hanoi ?, Fr. Indo China.*	*10.00 pm*
Luxembourg	*15350*	*19.54*	*Luxembourg.*	*8.00 pm*

NEW STATIONS LOGGED

PHILIPPINE ISLANDS.—On the 1st
tember we heard a very interesting
station operating from Manila, this b
one of the Voice of America outlets. T
come on the air nightly at 7.0 pm,
the playing of the "Star Spangled Bann
followed by the announcement, "This is
Voice of the United States of America, t
ing from Manila, on a frequency of 1
kc in the 25-metre band."

Records are then played continuously
a complete hour, followed by the same
nouncement each hour thereafter. This
the only announcement we have heard f
this station, so cannot give any details as
the address, &c., but a report should ea
find them, we think.

MALAYA.—During August, Singapore op
ed up again on one of the prewar frequ
cies used by that station, 9690 kc, and s
that time they have been heard at
good strength every night. The call let
of this outlet used to be ZHP, but so
the stations operated by both Radio Mal
and The British Far Eastern Broadcast
Service do not appear to use any call
ters.

This new outlet for Singapore is op
ated by the BFEBS authorities, but late
night they carry the same programme
Radio Malaya. The best time to hear th
is around 10.0 pm. Mr. Smedley and
Block have also reported this station
as we stated elsewhere, we received
verification nine days after sending our
port.

ITALY.—For some weeks now we h
been hearing an Italian station, operat
on 7250 kc in the mornings, around 6.30
Usually the programme is the same as
on Busto Arsizio, which uses 9630
and 11810 kc, but on other mornings it
ries a different programme. Strength of
nals is never as good as Busto Arsizio,
on some mornings it is very hard ind
to follow the programme at all.

This new station appears to close at ab
7.35 am, but by that time at our locatio
is nearly inaudible. A report has been
to the Italian authorities on this station,
in due course we should know where
new one is located, and whether rep
should be sent to the same address as
Busto Arsizio.

LUXEMBOURG.—From both Rex Gil
and Radio Australia we learn that Ra
Luxembourg has been heard testing on
new frequencies, 9527 kc and 15350 kc.
has heard this first frequency, but so
has not heard the 15350 kc outlet. The s
tion authorities give the following
schedule of times on the air, all being EA
2.10 pm to 3.10 pm, 15350 kc; 3.10 pm to
pm, 6090 kc; 8.0 pm to 8.40 pm, 15350
8.40 pm to 9.0 pm, 9527 kc; 3.0 am to
am, 15350 kc; 3.40 am to 4.0 am, 9527
and 5.0 am to 7.30 am, on 6090 kc.
doubt they will later use a frequency
the 25-metre band, so listeners should wa
out for it.

BELGIAN CONGO.—The Belgian Natio
Short Wave station in Leopoldville has b
heard using a new frequency of 11645
in their programme directed to Great
tain and the British Territories in Afr
from 6.30 am till 7.45 am. Strength of
nals is good throughout the transmiss
and the lady announcer has a very pleas
voice.

The call letters of this new outlet are
known, as when the station closes t
announce as OTC5 in the 16-metre band,
evidently they are using this new outlet
known to the announcer, who just gives
call for the 16-metre channel. Incidenta
there is no sign of OTC5 at our location
the times mentioned.

NEW ZEALAND.—According to a rep
from Art Cushen to Radio Australia,
long-awaited New Zealand short wave
tions have at last begun test transmissio
So far, the only channels reported as be
used are ZL2 on 9540 kc, and ZL3, on 11
kc. The time of these test transmiss
were from 7.0 pm til 8.0 pm.

At time of writing we have not he
either of these stations, nor have we
any reports from other listeners, though
expect that before very long they will
reported from many parts of this coun
as they should put in a good signal, c
sidering the power they intend using.

GEAR BEHIND RADIO PHILLIPINES

PROGRAMMES AND TECHNICAL DETAILS

BC's general manager is Norman Paige, noted war correspondent and formerly th each of the major networks of the ited States at different times. Just prior the war, Mr. Paige was production mana- r of KGEI, powerful short-wave station in n Francisco.

Production manager of PBC is "Hank" iller, formerly with the "Voice of America." ief engineer is Gerino Pancito, outstanding gineer in Philippine radio prewar as well as day. News edtor is P. J. Rappaport, for- erly with United Press. A staff of 60 per- ns is required to operate PBC and the ogramme policy is designed to provide the st in radio entertainment and information r Philippine listeners and short-wave listen- s as well. Its policy of good music is ghlighted by four major transcription raries, Standard, MacGregor, World, and ssociated, the latter two being of vertical t and being of particularly good quality reproduction. Supplementing this is a rge library of recordings and world-wide ews coverage is provided by Associated ress.

PORTING

One highlight of the programming of PBC's ations is special events, and "on the spot" oadcasts. The average monthly total of mote broadcasts of KZPI alone is well over 0. These include dance bands, US Navy eather forecasts, stock market reports, verage of large fires, sporting events, gov- nmental functions, concerts, and count- ss others.

Making this great number of remote broad- sts possible are 28 permanently installed ecial broadcast lines to all parts of Manila d vicinity; special equipment allowing e immediate use of any telephone line (and equently the telephone) for a regular broad- st; and two additional portable large VHF ansmitters for use in remote districts or for ng broadcasts where lines are not avail- le. The studios of the Philippine Broad- sting Corporation's two stations KZPI and ZOK and the main offices of the company e located on the 5th and 6th floors of the lipinas Building, Plaza Moraga, Manila.

CHEDULES

KZPI is on the air from 6.0 am to 12 idnight, Manila time (2200-1600 GMT) daily d Sunday from midnight to midnight 600-1600 GMT). The programmes are oadcast simultaneously on 800 kc and 9500 . This station broadcasts almost entirely English with a very small amount of agalog (the Philippine national language), d Spanish. The identifying phrase of ZPI is, "This is the Philippine Broadcast- g Corporation, Radio Philippines . . . ZPI Manila 800 on your dial."

KZOK, which started broadcasting on May , 1947, is on the air 24 hours a day ex- pt from midnight to 5.30 am, Sunday, anila time (1600-2130 GMT Saturday), when s transmitters are off for maintenance. ZPI is on the air during these hours.) multaneous transmissions of the pro- ammes are made on 1000 kc and 9690 kc. e daytime schedule of broadcasts is almost clusively in Tagalog, with some few pro- ammes in Spanish. The hours from 1600 2130 GMT are in English. The significant entification of KZOK is "Ito ang Philip- ne Broadcasting Corporation, Radio Fil- inas, KZOK, Maynila, Ang Tinig Ng Bayan." The transmitters of KZPI are located at lo, Bulacan, approximately 13 kilometres north of the Manila studios. The 800 kc transmitter is a 1000-watt output, "Pactron" custom built unit made by Pacific Electronic Corporation of Long Beach, California.

The final tubes are a pair of 4-250A's, and the output is fed to a 300 feet vertical radiator, the tallest standard broadcast antenna in the Far East. The short-wave transmitter was put into operation in December, 1946, on the 31-metre band, first on 9710 kc, then 9690 kc, and now on 9500 kc. It is a 250-watt transmitter built by Technical Radio at San Francisco, Cal., and 813's are used in the final. A half-wave vertical "L" antenna is used. KZPI transmitters are fed from the studios both by line and by VHF transmitter operating on 97.4 mc.

KZOK transmitters are located in Quezon City (in the outskirts of Manila and formerly called San Francisco del Monte). The 1000 kc transmitter was built by Craig B. "Tex" Kennedy, of KZICB-KA3CB amateur radio fame, and Harry T. "Slim" Chaney.

Gamatron 454 H's are used in the final stage, and the output is fed to a Hertz antenna, the maximum radiation of which is north and south. The short-wave transmitter was commissioned the latter part of July, 1947, in the 31-metre band on 9690 kc. It was built by Technical Radio of San Francisco, Cal., using 813's in the final with an output of 250 watts, which is coaxially fed to a dipole antenna having maximum radiation north and south.

F.M. TO COME

Future plans of the Philippine Broadcasting Corporation call for the almost immediate operation of an FM transmitter "Pactron" 250-watt on 101 mc; soon there will be an increase in the power of all transmitters now operating; construction of a Philippine network (medium wave) with outlets in Cebu, Iloilo, Zamboanga, Davao, and Tacloban. Plans are also in the making for moving the studios and offices of both KZPI and KZOK to a new and bigger location. Reports of reception are requested and will be verified.

As readers will see from the above description, the Philippines Broadcasting Corporation is a very modern organisation and has already become very popular with Australian listeners due to a large extent for the prompt and courteous way they verify listeners' reception reports. They are now olso sending out their monthly advance programmes by air mail.

STATION ADDRESSES

XMAG.—Army Advisory Group, APO 909, c/o P.M., San Francisco, Cal., USA.

XMPA.—10 Snake Mountain, Hanchungman, Nanking, China.

CR7RE.—Radio Clube de Malange, P.O. Box 83, Malange, Angola.

HHCN.—Avenue Christophe Number 25, Port-au-Prince, Haiti.

VP4RD.—Trinidad Broadcasting Co. Ltd., Broadcasting House, Port of Spain, Trinidad, B.W.I.

XURA.—Chong Sun Park, Taipeh, Taiwan.

PCJ.—P.O. Box 137, Hilversum, Netherlands.

CXA.—Radioemissora CXA19, 18 de Julio 1393, Montevideo, Uruguay.

XEFT.—Radioemissora XEFT, Independencia No. 74, Vera Cruz, Mexico.

XEQQ.—Radioemissora XEQQ, Jose Maria Marroqui No. 11, Mexico City, Mexico.

VUC.—Station Director, All India Radio, 1 Garstin Place, Calcutta, India.

THIS MONTH'S VERIFICATIONS

KZPI, Manila.—In addition to a very nice tter from the Production Manager, this ation sends a very attractive card showing e call letters in red. Full details regarding is station and also its sister station, KZOK, e covered in the special article in this sue. Unfortunately KZPI is rather hard to g on its new 9500 kc channel but late at ght it seems to be much better.

RADIO INTERNATIONAL, TANGIER.—is African station sent a very nice letter in glish verifying our report on their trans- ission on 6200 kc and stated that they are present giving programmes in French, anish, Arabic, and English.

They give their schedule as 0000-0300, and 00-2300 G.M.T.; the address of this station Radio International, Sociedad Africana de adiodifusion, 34 Goya-street, Tangier.

SINGAPORE, Malaya.—The British Far stern Broadcasting Service are now using a very simple verification card which gives their schedule as 0830-0030 G.M.T. daily using a power of 7½ kw on frequencies of 6770 kc, 11,735 kc, 9690 kc, and 15,300 kc. In their accompanying letter the Programme Director advised that they were planning to use a new frequency in October but did not state what it would be so readers should keep a check on the bands. Our card for this one was sent by air mail.

JERUSALEM, PALESTINE.—The Forces Broadcasting Station in Jerusalem in verifying reception of their test transmissions on 7220 kc and 7250 kc sent along a list of their programme for the ensuing month. The verification was very simple being just a few words on a very large sheet of paper, what one might say British officialdom at its best. However these verifications came along in very quick time, both being sent by air mail.

FLASHES FROM EVERYWHERE

SWEDEN.—In one of the recent DX sessions from Radio Australia we heard that Sweden is another country to enter the high power field. The Swedish Radio has ordered two 100 kw transmitters, which, used with beam aerials on seven frequencies, will have world wide coverage. These transmitters, however, are not expected to be in operation until some time in 1950. Mr. Arne Skoog, DX editor of Roster I Radio, has offered to send any listener a world-wide short-wave call list on receipt of two International Reply Coupons. Send your application and two coupons to R.I.R., Box 16174, Stockholm 16, Sweden, and Mr. Skoog will forward the list.

AUSTRIA.—There seems to have been quite an amount of frequency shuffling by the Vienna station, and it is hard to keep track of just where they are to be found. An observer in North Africa informed Radio Australia that Vienna was to be found on 6150 kc, 7195 kc, 9670 kc, and 11,785 kc. At our location we have heard them on 7180 kc in the mornings and also in the late afternoon on 11,780 kc. In addition to these frequencies, Vienna has also been reported by overseas listeners as using 9830 kc and 12,210 kc though we believe both these frequencies are no longer in use. The loudest signal just now is between 6.30 am and 7.0 am on 7180 kc.

IRAN.—The well-known Iran station EPB located in Teheran and operating on 15,100 kc can now be heard quite well when they give news in English at 10.15 pm. Most of the items can be followed, which makes good material for a report, and in addition both before and after the news, they play popular recordings, some of which will be identified by most listeners. Radio Tabriz has also been in the news of late and Rex Gillett reports a station on 12,000 kc with native type music, closing at 6.0 am, which we think may be Tabriz. We have also heard what seems to be the same station on 11,995 kc, though on all occasions when we have heard it, 7.0 am has been the closing time.

AUSTRALIA.—As a change from the normal type of stations, have a listen for some of the trawlers operating along the NSW and Victorian coasts. The best time to hear them is at 8.0 am and 5.0 pm, when they are in contact with VIS Sydney and VIM Melbourne. The frequencies most used are 6280 kc., 6400 kc., and 6675 kc.

Some time can also be spent listening to the various aircraft in contact with the radio towers at many points from Mascot to as far north as Townsville. The best frequencies to hear these are those around 6500 kc, and it was while listening on these bands the writer was able to advise the Sydney newspapers that the Dutch airliner which disappeared a few months ago, had been located. There is always something of interest around these bands.

PANAMA.—It is some considerable time since we have had any report about the Panama station HOB, and we were, therefore, surprised to log this one again at quite good strength recently when it opened at 9.30 pm. Its frequency is 6175 kc, and it is rather difficult to separate HOB from LRM, which uses 6180 kc. When this station opens, it gives both its broadcast band call HOA, followed by the short-wave call HOB.

100 FIRST AUSTRALIAN REPORTS —1000 VERIFICATIONS

THIS month we are very pleased to be able to advise listeners that something the writer has been striving for over the past few years has at last been obtained—100 First Australian reports and 1000 verifications. Actually the total at time of writing is 103 "firsts" and 1002 verifications.

These verifications have been obtained over a period of about 14 years and all of them are for phone reception, 98% are for commercial short wave stations with only 2% amateurs.

For some reason or another we have been particularly successful with Singapore and from a total of 22 veries from this location, 13 of them have been "firsts."

The "first report" verifications are from 36 different countries while total number of countries verified now stands at 131 with reports out to 7 others. Only about 5% of our reports have been sent by air mail and these almost exclusively to Malaya, India, Ceylon, &c. The quickest verification we have ever had was the last one we received being for Singapore on 9690 kc which arrived nine days after posting our report.

We hope the above will prove of interest to listeners, especially the younger ones who are just commencing the hobby, as it shows what can be done by watching the bands carefully and always being on the lookout for new stations. It is also an incentive to have something you are trying to get and eventually to be successful.

With our Short Wave Reporters

MR. ERN. MOORE OF BRISBANE

JUDGING by the few letters we have received before this issue goes to press, our new feature giving details of our various readers has been well received, and it will be continued during the next few months. This month we have information concerning a well-known Brisbane listener, Mr. Ern Moore, and without any further preamble we will let Ern tell his story.

"I have been interested in DX listening for about 10 years or so, but it was not until October, 1940, that I sent out my first report, this being to KGEI. At the present time I have 235 veries from commercial short-wave stations, though some of them are second or third verifications from the same station, but counting one verie from each station, my total would be about 216 from a total of 53 different countries. In addition to the above I also have 264 veries from broadcast band stations, mostly Americans, and 149 from amateur stations on the 20, 40, and 80-metre bands. Cards from these amateur stations are from 23 different countries.

The verifications I prize most are those from LRM, HJCX, HJDE, OIX1A, HJCA, ZNB, CKFX, PZX5, and ZFY. I do not think there are many listeners in Australia who have a verification from HJDE. I am afraid I do not have any "first" from Australia veries for short-wave reception, but have a few for broadcast band Americans and some of them low-powered stations.

My main interest in short-wave stations are the Latin Americans, and also I am very interested in the amateurs.

When I first became interested in short-wave stations I was using a one-valve battery regenerative set, which gave very good reception and then in 1937 we bought the set we are now using, a 6-tube DW commercial job with short-wave range from 16 to about 52 metres. The antenna used is an inverted L, 75 feet long, 30 feet high, running NW to SE. In the near future I hope to have a BC348, which is an American Air Force receiver covering from 200 to 500 kc and 1500 to 18,000 kc in six bands with dial calibrated in MC. I also hope to erect some different antennas in the near future, and this will be of great use when tuning to different parts of the world.

I am a member of the URDXC, NZDXC, and ADXRC, and am Queensland official observer for ADXRC.

As will be seen from the above details, Ern is a very enthusiastic listener, and he certainly has some very nice verifications, which prove beyond doubt his ability to log the hard ones as well as the more common type of station. We can expect to hear more of him when he gets his new receiver in operation.

Next month we hope to give details of a DX listener who is known by name to all keen DX'ers both in Australia and overseas.

THESE STATIONS VERIFY

CARDS or letters have been received by these readers confirming their reception of the following stations:

Mr. W. R. Holland.—VUC 9590 kc, VLQ3, KRHO 9650 kc.

Mr. Rex Gillett.—Jerusalem 7250 kc, SEAC 17,770 kc, TGWA 15,160 kc, Johannesburg 3450 kc, WNRX 21.610 kc, WNRA 17,780 kc, WNRE 15,280 kc, WNBI 15,150 kc, ZQP 7290 kc, 9710 kc, CKRA, HS8PD 6125 kc, Dakar 15,380 kc, CE1180.

Mr. Art Cushen.—XECC, TGWA, Monte Carlo, WLWL 17,955 kc, CKRA, Kuala Lumpur, Luxembourg, VUM2 4920 kc, VLW7, VLC9, VLC, VLA7, CKCS, WLWR 9700 kc, WRUW 17,750 kc, WRUS.

Mr. H. R. Cox.—SEAC 17,770 kc, Malaya 15,275 kc, CKRA, CKNC, VLC9, VLA6, VLW3, VLB8.

Mr. F. J. Smedley.—WLWS 11,710 kc, WLWR 15,250 kc, WLWO 11,710 kc, WLWL 17,950 kc, WLWK 17,800 kc, VLA8, VLA10, VLC, VLC6, VLC8, VLB10, VLG4, KRHO 15,250 kc, PCJ, HCJB 12,450 kc.

Mr. T. R. Boyd.—VLB5.

Mr. P. Kayser VLR2.

Mr. R. K. Clack.—KU5Q 13,360 kc, VLG6, VLC9, FZI 11,170 kc, XGOY 11,913 kc, Noumea 6160 kc, Macao 7500 kc, HCJB 12,455 kc.

Mr. M. Foster.—Noumea, VLR2, VLR, VLC4, VLW3, VLH3, VLG10, VLA5, VLA6, VLH4, VLH5, VLW7, VLC7, VLB, VLG6, XGOA, XGOY, FZI, SEAC 17,770 kc, 15,120 kc, Malaya 15,275 kc, CHOL, CKLO, HER5, WOOW, Madrid.

Mr. R. O. Block.—Omdurman 9650 kc, Rangoon, VLC4, Saigon 6190 kc, WLWR 9700 kc, WLWO 15,350 kc, VLG3, VLG6, VLA5-7, VLC8-9.

READER'S REPORTS

THE following readers have sent in letters and reports of their reception. These are greatly appreciated and also the many kind remarks concerning the short-wave notes.

Mr. W. Gunn, Christchurch, NZ; Mr. W. Milne, Christchurch, NZ; Mr. R. Shave, Eastwood, NSW; Mr. M. Foster, Mount Vincent, NSW; Mr. H. R. Cox, Cobden, NZ; Mr. R. Matthews, Perth, WA; Mr. A. Cushen, Invercargill, NZ; Mr. G. Major, Manjimup, WA; Mr. C. W. Jones, Gladesville, NSW; Mr. G. D. Gilbert, Burwood, NSW; Mr. P. Kayser, West End, Qld; Mr. L. Donnelly, Port Campbell, Vic; Mr. A. D. Addis, Ascot, Qld; Mr. A. T. Lane, Dalby, Qld; Mr. D. A. Ramsay, Greymouth, NZ; Mr. J. Jensen, Bankstown, NSW; Mr. N. Armstrong, Burwood, NSW; Mr. M. Krumbeck, Carlton, NSW; Mr. J. Hughes, Smithtown, NSW; Miss M. Woods, Geelong, Vic; Mr. J. Nash, Parkville, Vic.; Mr. G. Garside, Melbourne, Vic; Mr. Rex Gillett, Prospect, SA; Miss D. Sanderson, Malvern, Vic; Mr. F. J. Smedley, Landsborough, Qld; Mr. J. Malcolm, Dunedin, NZ; Mr. R. Holland, Canterbury, Vic; Mr. R. B. Yates, Glenelg, SA; Mr. R. O. Block, Petersham, NSW; Mr. E. Moore, Brisbane, Qld; Mr. A. Lee, Merewether, NSW.

"VOICE OF AMERICA—MANILA

The new Manila station on 11,840 kc mentioned in this issue began regular transmission of the Voice of America programmes as from 11th Sept. An announcement regarding this was given from KRHO and Mr. J. Saunders was kind enough to advise of this announcement. Quality of this station is not particularly good as yet, but will probably improve.

CR6RL LUANDA, ANGOLA

THIS new station has just been logged at our new location and can be heard every morning till it closes at 7.0 am with the Portuguese National Anthem. Popular recordings are played and then just before closing, a male announcer gives two calls, the first of which sounds like CR6RA, which would be the call of their other outlet on 9470 kc which has also been heard on some mornings. CR6RL is being heard on a frequency of 15,900 kc, though Graham Hutchins of Radio Australia, advises that they are actually assigned to 16,172 kc. We understand that this station is operated by the Radio Club of Luanda and this is the only address we have at the present time.

SERVICEMAN WHO TELLS

(Continued from Page 53)

the car with farm produce. I rath
felt that the few hours so spent add
to the variety of the weekend, desp
the service job sandwiched in.

The radio receiver turned out to
a four-valve superhet of a general d
sign which branded it as about 19
vintage. Although justifiably popu
in the suburbs, the basic four-va
superhet arrangement is definitely
the borderline as a rural receiv
Valve for valve, the gain is lower th
in the a-c job and, of course, t
strength of signals is much less.

I could find nothing obviously am
with this particular receiver.
operating voltages were OK, and t
alignment was accurate, as far as
could judge without the services of
oscillator. Aerial and earth were O
but it definitely sounded weak.

The final step was to test all t
valves, which fortunately I could
because the a-c had just been co
nected to the house. Sure enoug
each of the four valves registered
the "doubtful" part of the scale, i
dicating that they had just abo
reached the end of their useful li
Perhaps it was only to be expecte
because the set had been in operati
for a good 10 years.

In a larger set, or on strong signa
one or two valves can be in this co
dition without much difference bei
apparent to the casual listener. B
four weak valves in a four-valve ba
tery superhet makes the difference b
tween just enough gain and the r
verse. So much for that one.

OUR OWN LISTENING POST

Radio International 6200 kc, FZI 17,530
KZPI 9500 kc (1st report from Australia
Jerusalem 7220 kc (1st report from Australia
Jerusalem 7250 kc, WLWR 15,130 kc, VU
11,830 kc (1st report from Australia), Sing
pore 9690 kc (1st report from Australia
SEAC 15,230 kc.

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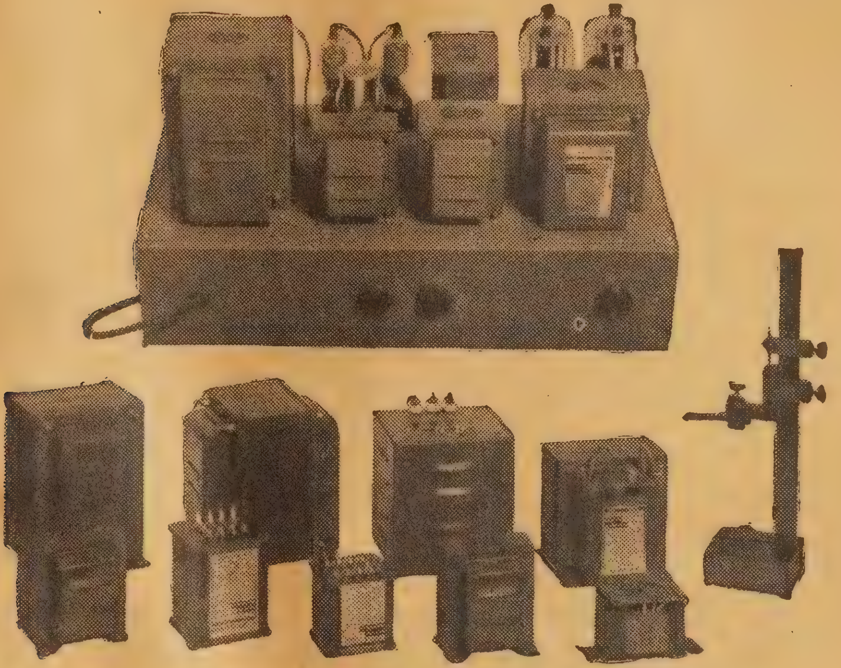

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THE HAM BANDS WITH BILL MOORE

The amateurs of the world received news late in August, giving an indication of how they would fare in the handing out of frequencies, at the I.T.C. Atlantic City.

It was the news, that they had lost 50 kc. of their now more than fully occupied 14mc bands. The new band would now cover from 14,000 to 14,350 kc's, the lost 50 kc's going to fixed services.

The news came from the ARRL via the WIMK broadcasts and stated, that, after seven weeks' study, the new limits were arrived at and the effective date would be decided later. A footnote stated, that, the higher 100 kc's would be shared with Russian domestic stations. The final decision was unanimous, USA and Canada reluctantly agreeing (whatever that means).

We can only hope that the shared portion is shared with the KW American phones, it won't be much use for even domestic work then.

It didn't take long for the various nations to forget the remarkable war efforts of the world's 100,000 hams. We know in Australia that it was the amateur that was called on to pull the services out of their communication problems early in the war. Now it seems a matter of how much of the ether can be acquired to blast forth propaganda, for the consumption of the unsuspecting SWL.

The British Empire group incidently, were not too generous in their support of amateur requirements. Great Britain herself being particularly reticent. Recently we heard praise of Australia's amateurs in war, we feel however that more support in peace would be a little to the point.

There seems to be only one way—a respectable slice of the radio spectrum around 21mc. in compensation. American manufacturers of ham equipment are so optimistic, that they are including this band in their newly designed receivers and we can only hope their hunch is correct.

AMATEUR AWARDS

QUITE a number of amateur national societies award certificates for outstanding amateur work. Those of an international nature, are mainly awards for DX and operating prowess.

The best known of these are the WAC (worked all continent), WAS (worked all States-USA), and DXCC (DX century club) issued by the ARRL; the WBE (worked British Empire) and BERTA (British Empire Radio Transmission Award) issued by the RSGB; the DXCC issued by the WIA. The following information gives an idea of the qualifications necessary to acquire the awards.

The first of the ARRL awards, the WAC is available to amateurs, who contact a station in each of the six continental areas; namely North America, South America, Oceania, Africa, Asia and Europe. The exact boundaries have been presented in QST on numerous occasions. The applicant must be a member of the IARU national society of his country and should submit the 6 QSL cards for verification to the HQ of the National Society. They will advise the ARRL to issue the award. The WAS is an award available to all amateurs who can produce QSL cards verifying contacts with stations in all 48 States of the USA (district of Columbia and Marvland interchangeable).

The cards should be submitted direct to the ARRL.

The DXCC award is divided into tw qualifying sections.

The first award is made to amateurs wh can produce verification of QSO's with 10 countries at any time, either prewar or post war. The postwar contacts must howeve be listed as countries in prewar QST lists

The second award is for a postwar DXC and stickers will be available for each additional 10 countries confirmed. These 10 countries must conform with postwar QS lists.

The certificate is a very handsome on and an ornament for any shack. The card must be submitted direct to the ARRL an return first class postage should be enclosed.

The RSGB's two awards are the WBE an BERTA. The first is awarded for verifie two-way contacts with a British station i five areas. The same as for the WAC except that North and South America are combined. The certificate will be endorsed fo phone or CW and for 28mc phone or CW The certificate is free to RSGB members o at a cost of 2/6 to non-members. Apply to the RSGB, New Ruskin House, 28 Little Russell-st., London, WC1. Cards must be forwarded together with application.

The BERTA is available under the same conditions, except that cards must be produced showing two-way contacts with 25 call areas in the British Dominions (VK2 to 9, VEI, ZS, &c.) and with 15 stations in the colonies (VQ2, ZMG, VRI, &c.). A minimum of R3 and a note not worse than T8, must be shown on each card for RSGB awards.

The Australian DXCC run by the WIA, is a postwar club and is open to all Australian amateurs. When you get your 100 countries confirmed send them along to your divisional secretary, who will do the rest. The call signs of club members will be listed under Phone, CW and Open sections in Amateur Radio. The ARRL countries list will be used for checking.

If you feel you would like any of the above awards and you have qualified, it won't take long to pen the necessary letter.

6 MX RECORD

THE 6MX distance record has been broken again, at 0310Z, 26th August, VK5KL in Darwin and W7ACS/KH6 made history in a two way contact. The previous record between KH6DD in Hawaii and J9AAK on Okinawa, made on January 25th., was over a distance of 4600 miles. The new one should be over 5000 miles.

VK5KL was using 100 watts and a three element horizontal beam and congrats. to 5KL on the first confirmed international contact from Australia on 6MX.

On the evening of the 24th August, the band again opened up for a short period between NSW and SA, and 2YQ, of Schofields, chalked up his first interstate contact. Time: 1930 hours, EAST.

Ross Treharne, VK2IQ, lectured on "Propagation" at the NSW UHF section meeting, on August 29th. Overseas visitor Paoum, UHF enthusiast, was present at the meeting.

UHF section secretary Morrie Finlay, VK2PW, has been rebroadcasting 2WI on 166mc. for the Sydney UHF gang. Incidentally, it is intended to make special 2WI Broadcasts on 6MX shortly.

The Newcastle and Coalfields gang are working extensively on 6MX and the first week in September saw their efforts rewarded, when they worked both into Katoomba and Schofields, 20 miles west of Sydney. Signals have been exchanged between 2LY, of Katoomba, and 2ADT, Cessnock, also 2BZ, Newcastle. 2YQ, Schofields, has worked both 2BZ and 2ADT. Maximum distance covered would be between 2LY and 2BZ, about 95 miles, the distance to Cessnock and 2ADT, 85 miles.

Prewar 2LZ, Wentworth Falls, and 2VU, Singleton, used to contact on 56mc., the distance being much the same as those covered now, but 2LY is in a somewhat more shielded location.

The contacts were made using vertically polarised antenna. It is intended to try horizontal polarisation in keeping with overseas, and radar practice at these frequencies.

At this stage it is only possible to review the NSW UHF gangs' effort on the Australian wide UHF field day, September 7th. Main NSW activity was centred on 166mc. 18 stations were active on the band and the following were operating mobile, 2YE, at Dural, 2AHG, Kurrajong, 2ADV, 2PW, Kiama and 2KP, in the Goulburn district.

Highlights included a contact between

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HG, at Kurrajong, and 2PW, at Kiama, a stance of 85 miles—believed to be a new cord for NSW.

2LY, working from Katoomba, to 2AHG, obile travelling in a car back towards Parmatta. 2KI struck trouble from the start not radio problems, but someone trying steal his car, besides get mixed up with local character. Stations active and not eviously mentioned, included, 2ABB, 2ABZ, LG, 2LZ, 2FI, 2TR, 2AGL, 2WJ and 2AHF.

Nothing opened on 5MX and it will be in-resting to see how stations in the other tates progressed.

ERU CONTEST

THE result of this year's BERU Contest are to hand and none of the major laces in either the senior or junior sections ere taken out by VK stations.

Senior Section:—

First, ZS2AL, 1864 points, second, VQ3HJP, 350, third, ZLIBY, 1225, VK2EO, 1118, G5WP, K2ADE.

Junior Section:—

First, ZL4GA, 828 points, second, VS9AN, 32, third, ZBIAD, 658, VK4RO and VK5RX ed for fourth place.

WL——

SOME of us who haven't kept records of our incoming QSL cards, often won-er what percentage of contacts really SL. We would quote the case of well nown SWL, Harry Whyte-Meach, of atoomba. He has forwarded 10,000 reports o amateur stations and with a complete lling system covering all stations heard, as kept a close check on QSL's. His efforts ave realised 1900 QSL card inwards. It's enerally accepted that the average ham eceives about 50 per cent. inwards cards.

CLUB NOTES

THREE meetings were held during July, at the society's room, Melody Hall, George-treet, Burwood. The first meeting of the onth took the form of a social evening ith the YL's and XYL's in attendance.

The two latter meetings were well attended espite cold weather. Lectures were delivered y Sid Clark, VK2ASD, "Data on Service ype Tubes," and John Warren, VK2QX, The Controlling and Switching of Broad-ast Programmes."

The society's membership is still increasing nd the financial statement was presented y the Treasurer, on July 17th.

FEDERAL NEWS

THE Federal Executive of the WIA intends to run during the weekend, August 14 nd 15, 1948, a contest in memory of mateurs who fell in the 1939-45 war. The eekend being the third anniversary of VP-ay.

It is intended to inscribe on the trophy, he names of all amateurs who paid the upreme sacrifice. The suggested name of he contest will be the "Remembrance Day ontest."

Amateurs could greatly assist the contest nanager, if they notified their respective ivisional secretary of any amateur friend vho fell during the war.

Don't forget the WIA's VK DX contest luring the four weekends in October, full ules appeared in the September issue of R. & H."

Ray Howe, VK2ARH's lecture on 'Aerials" at the August meeting of the NSW livision was well received and quite a few left vith better ideas on feeding their arrays.

The Queensland division's station 4WI roadcasts simultaneously on the 40, 20 and metre bands. The 20 metre transmission eing necessary to cover northern Queens-and and Papua. 4WI broadcasts tt 9 am n Sundays.

The WIA has grown rapidly since the war nd membership is over 2000 throughout he Commonwealth. The turning point in he Institute should come soon with the ppointment of a full time HQ staff. It is p to every amateur to give tne WIA his ull support.

PERSONAL

VS6AP is very pleased to contact any stations down under, he is ex-ZL2CP, well nown NZer prewar.

The Jamaicans have been consistent dur-ng the month. VP5JB 14,070, 5MU 14,135, 5AO 14,060. They generally work morse at pretty high speed—loudest VP is VP4TZ Trinidad 14,050, an American serviceman.

The queer ones of the month are V zero AK whose QTH sounded like Harbarrows and FA3XR RAC and wandering. Quotes Tahiti as a QTH, should be using FO8 as a prefix anyway.

HSISS's contacts are hoping and praying for a QSL—2YC, authority—quotes VP5's as the worst QSLers.

Three HK's have been consistent in the evenings, 3CX, 5RY, ICK 14,090, 14,120, 14,035 respectively. KX6USN on Bikini and KJ6AA on Johnston, were viciously attacked during the month by VFO's.

The Fijians had a hamfest on August 23. VR2AR, 2AO, 2AN, 2AT and 2AQ plus ZL210 were all celebrating in a liquid not made from coconuts.

VK4EL has 518 postwar G contacts up now.

The Port Moresby gang now boast VK9 callsigns and active are 9B1, 9NK, 9OU, 9GW and 9BM. 9B1 is packed up ready for a move to Finschafen. The rest of the gang work for the PMG.

TG9JK has been on 20MX with NBFN, sounds OK on a conventional receiver.

The new Middle East calls are in use, MD4AN in Somalia is very strong at 0430 hours—Swan Island, West Indies, produces KS4AF on 14,020 kc's.

The latest VFO stunt is being worked by a few W2's, they come up on the rare one's frequency towards the finish and implore you to give them a leg in—VFO attacks seem to be on the decrease or maybe one gets used to them.

The Africans on phone and CW are quite good from midnight onwards. ZE2JN, Box 225 Bulawayo, especially consistent, his delayed morse is a little hard to copy at first. CR7's ZS's and VQ2 to 6, all at fair strength.

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OFF THE RECORD — NEWS & REVIEWS

In addition to the "Planets" Suite, of Holst, a notable record issue of recent weeks, and probably the most important, is of Schnabel playing the Beethoven G Major concerto. This is undoubtedly one of the greatest of concerts, and vies with the "Emperor" and the C Minor as Beethoven's best.

By JOHN MOYLE

ARTUR SCHNABEL, Pianist and the Philharmonia Orchestra, conducted by Issay Dobrowen.—"Concerto No. 4 in G. Major, Op. 58." (Beethoven). HMV. ED.510/3.

Not so long ago, I commented on the stamp of maturity which stands out so clearly in Schnabel's work as compared with that of younger pianists. It is probably the most definite impression you will receive from this performance.

It has become almost a banality to praise Schnabel playing Beethoven; but how can it be avoided? You can examine this performance, movement by movement, subject by subject, phrase by phrase, and in each find the evidence of thought, of assessment, and execution. On this basis alone, not a note is out of place, every one falls unmistakeably into the structure of the whole. So fully formed is this structure, so balanced and complete, that we are left, as always, with the impression that a great man has said the final word.

This does not mean that the earlier Gieseking records, for instance, are not in their own way, fine in performance. But it does mean that Schnabel has given his version, in full-bodied, "old master" style, in such a manner as to lessen by sheer comparison the achievements of others.

It may be that Schnabel has somewhat over-awed the conductor in the first movement, for I felt he had not the same fine control over his players as he shows in the remainder. This does not spoil the work, but it tends to outline Schnabel a little more clearly in relief than otherwise would have been the case.

In a recording with no real weaknesses, I was particularly impressed with the short second movement—probably the shortest in all Beethoven, and certainly one of the most beautiful. Both the pianist and orchestra show the most exquisite control in tempo and tone.

Against this movement, the scintillation which opens the third and last, shines like a shower of light. No one can make a piano shine and glow like Schnabel. His work here is a lesson in tone production to those modern pianists, who, if they are given half a chance, apply their hammer-like fingers to everything in the same manner.

The recording is immeasurably superior to the old pressing, and although not in the very top line for brilliance, is completely satisfying. You will need no urging to hear this excellent set.

ARTHUR GRUMMIAUX AND JEAN POUGNET (Violins), with Philharmonia String Orchestra. Conducted by Walter Susskind.—"Concerto in D Minor, for two Violins and Orchestra," (Bach). COLUMBIA DOX.854/5.

One of Bach's loveliest and noblest works of its kind. I thought this concerto captured all one could desire in its performance. That precision that is so essential is there, together with the flexibility and clear outlines required to bring out all the intricacies of counterpoint and orchestration. The fine second movement, always a favorite of mine, is splendidly performed, although all three are on the same general plane.

The solo-ists and orchestra blend well In this regard, it is a better work than I have heard produced by more famous names, who possibly, are somewhat more conscious of that fact. . . .

To sum up—another must for your list

THE HALLE ORCHESTRA, conducted by John Barbirolli.—"Symphony No. 3" (Bax). HMV. EB.376/81.

I cannot be considered a satisfactory reviewer for this symphony, for I find great difficulty in maintaining interest through its twelve sides. I can only say that my impression is of careful, and at times, distinguished work, produced, I was almost going to say manufactured, by a man who unquestionably knows music and orchestras.

But more than that, I can't recognise, at least in this sample of it. There is to me, much more of perspiration than inspiration, if Bax can be accused of a natural function so plebian.

I am, therefore, sufficiently honest to let you be the sole judge of its merits. Apart from Elgar, Vaughan Williams, and a few others, many of these English large-scale composers are somewhat beyond me.

From a recording point of view, it is quite good, and it is recorded under the auspices of the British Council.

ARTHUR FIELDER'S SINFONIETTA.—"Concerto Grosso No. II in B Flat Major, Op. 6," (Corelli). HMV. EB.385.

A good record, as are most produced by this orchestra. Everyone likes Corelli, and it will deserve your approval.

WOODY HERMAN AND HIS ORCHESTRA, conducted by Igor Stravinsky.—"Ebony Concerto." COLUMBIA DOX.853.

One of the most striking records I've heard for many a day. I may be in a minority—amongst many friends to whom I've played it I certainly am, but it has a vitality and force, obtained almost entirely by musical and dynamic accentuation and omission, which makes it a musical cartoon of the highest order.

The recording is equally striking. If I am not mistaken it is certainly a FFRR job. Played on some special equipment with which I have been experimenting, its high frequency range is amazingly good. One is struck with admiration at the realism of the muted trumpets, in which the metallic quality is equal to anything I've heard on a disc.

The reeds of the saxophones, too, are astoundingly life-like. If you have a good amplifier, you will, I'm sure, get just as big a shock as I did on hearing the first notes.

Musically, I warn you, it's not for everybody. But of its kind, it is truly a sensation on all accounts.

JAN PEERCE, Tenor (With Victor Orchestra).—"Bluebird of Happiness" and "Because." HMV. ED.514.

Although the first named song is in my opinion, one of the worst ever written, this record gets by because of its fine recording of a fine voice. Jan Peerce isn't well known yet, out here, although very popular in America. He is typically American in style, but with much more music in his voice than at least one popular brass-lunged producer of decibels. This record has all the earmarks of being a best seller.

Other Recordings Recently Released

DECCA

BING CROSBY AND THE JESTERS.—"Dear Old Donegal" and "McNamara's Band." Y.6038.

INK SPOTS.—"That's Where I Came In" and "I Want to Thank Your Folks." Y.6035.

BOB CROSBY'S BOB CATS.— "Way Down Yonder in New Orleans" and "Jazz Me Blues." Y.6037.

BING CROSBY WITH ORCHESTRA.—"Ol' Man River" and "I've Tried Ev'ry Little Star." T.6036.

ADA ALSOP, Soprano with BOYD NEEL STRING ORCHESTRA Conducted by Boyd NEEL.—"Oh Sleep! Why Dost Thou Leave Me" and "Come, Beloved." Z.876.

WATSON FORBES (Viola) and Denise Lassimonne (Piano).—SUITE OF THREE DANCES—Pt. 1—Rigaudon; Pt. 2—Menuet; Tambourin. Y.6026.

REGAL-ZONOPHONE

TOMMY TUCKER AND HIS ORCHESTRA.—"Another Night Like This" and "(Oh Why, Oh Why, Did I Ever Leave Wyoming" G.25133.

KAY KYSER AND HIS ORCHESTRA.—"If My Heart Had a Window" and "Boin-n-n-ng." G.25134.

BILLY WILLIAMS AND THE PECOS RIVER ROGUES.—"My Adobe Hacienda" and "(I'll Ride) Across the Purple Sage." G.25135.

JIMMY LEACH AND HIS NEW ORGANOLIANS.—"Mister Moon, You've Got a Million Sweethearts" and "Accordian." G.25136.

TOMMY TUCKER AND HIS ORCHESTRA.—"Maybe You'll Be There" and "You Don't Learn That in School." G.25137.

GEORGE FORMBY WITH ORCHESTRA.—"It Could Be" and "We've Been a Long Time Gone." G.25138.

DICK JURGENS AND HIS ORCHESTRA.—"I Miss That Feeling" and "That's Where I came In." G.25132.

ANNE SHELTON WITH ORCHESTRA.—"More Than Anything Else in the World" and "I'll Dance at Your Wedding." G.40324.

THE RHYTHMIC TROUBADOURS.—"Each Little Hour" and "When China Boy Meets China Girl." G.25142.

ELTON BRITT WITH VIOLIN, BASS AND GUITARS.—"Darlin', I've Loved Much too Much" and "She Taught Me to Yodel." G.25143.

RILEY PUCKETT, Singing and Yodelling.—"Way Out There" and "Cowboy's Dying Dream." G.25121.

MICHAEL O'REGAN (the Singing Broadcaster) with KNIGHT BARNETT AT THE ORGAN.—"Smiley" and "Where the Blue Gums Turn Red in the Sunset." G.25144. "The Paradise in Mother's Eyes" and "Beautiful is My Old Lady." G.25145. "The Silver in My Mother's Hair" and "When I was One Year Old." G.25146.

FELIX MENDELSSOHN AND HIS HAWAIIAN SERENADERS.—"Carefree" and "Wabash Blues." G.25122.

HMV.

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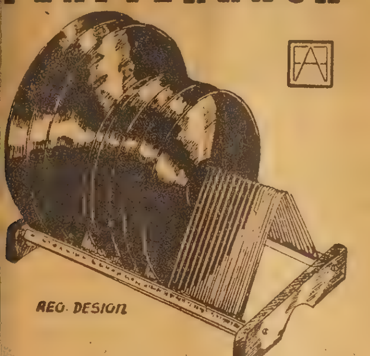

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ANSWERS TO CORRESPONDENTS

UNDER THE PERSONAL SUPERVISION OF THE TECHNICAL EDITOR

M.S. (Mt. Henry, WA) reports having built up the "Little Jim" receiver with excellent results.

A. Many thanks for your report on the set and we are glad that it has proved so successful. The explanation for the condenser breakdown is probably that you did not provide for sufficient bleed current to prevent high peak voltage on the first filter, with the inevitable result that it failed. We take it from your later remarks that you now have a single input choke and following filter condenser which would be a better arrangement. Glad to note that you like the "Serviceman Who Tells" feature.

R.B. (Jeparit, Vic.) has built up the "All Wave Battery Three" but complains of poor tone, harsh reaction and whistling effect.

A. It is very evident from your letter that the set is suffering from some form of audio instability, although the exact reason for this is not clear. Make sure that you have not inadvertently connected the 10 mfd condenser the wrong way around and that the 8 mfd condenser is in circuit and in good order. Put shields over the first two valves and shield the two "hot" leads to the volume control. As the tuning coil is unshielded, we suggest that you make sure that it is well clear of the output wiring and that the leads to it are as short as possible. You will probably find that elimination of the instability will clear up all your complaints about howling and poor tone. The dynamic microphone may just give enough output into the pickup terminals of this set but you will very likely have to connect it between the grid of the detector and earth. The tone will be very high pitched and severe howling will naturally result from any attempt to operate the microphone and loudspeaker in the same room.

R.A.W. (Portsea, Vic.) is anxiously awaiting an article on an auto radio and suggests that we should describe a few aerial systems for use at UHF.

A. We have not been able as yet to tackle the design of another auto set as there are so many other projects to be dealt with in very limited time. We agree that articles on aerial systems would interest quite a few readers but, once again, time and space is our problem. Thanks for your encouraging remarks.

K.M. (Barmera, SA) sends in his subscription and comments favorably on "Radio & Hobbies."

A. We are pleased to note that you have been able to learn so much from reading our magazine. Glad to note, also, the results from the "Little Jim's Mate" and we will bear in mind your suggestions for other articles.

M.S. (Sth. Perth, WA) asks whether it would be possible to replace one of the valves in the "1K5-Four" with a type 30.

A. You could replace the 1K5-G detector with your 30valve, provided the latter is not unduly microphonic. Simply omit the two components which supply the screen potential. The resultant reduction in gain could be offset by remitting the 1-meg feedback resistor between the plates of the last two valves.

E.M.C.O. (Broken Hill, NSW) wants to know the operating voltages of the EF50 pentode valve.

A. We are publishing full information of this type of valve in this issue.

D.D. (Casino, NSW) renews his subscription and expresses his appreciation of the information contained in "R. & H." He also suggests that a few hints on home-wound loop aerials would be appreciated by many readers.

A. Many thanks for your subscription. We have described the loop aerial on one or two small receivers but, when it comes to winding the loop to track with the oscillator coil, we feel that it is better to rely on the commercial types.

B.H. (Pine Creek, Qld.) writes to tell of his experience and gives his ideas about model flying clubs.

A. Many thanks for your letter which we read with considerable interest. We agree that shortage of materials and cost of motors is a disadvantage, but the position should gradually improve.

N.G. (Marrickville, NSW) says he has built up an autodyne superhet. to an old "R. & H." circuit but finds that he has difficulty in tuning of all the desired stations.

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1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.
2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."
3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."
4. Blueprints of exact size chassis layouts with all essential holes and cutouts will be supplied if available for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, "Radio & Hobbies," Box 2728C, GPO, Sydney.

A. It would seem from what you say that the trouble is due to unsuitable tuning condensers. Apparently your .0005 condenser has a very high minimum capacitance which is preventing it from tuning the high frequency stations. There seems to be some confusion about the values of capacitance quoted, but there is no other obvious reaso for the trouble. We suggest you use a tw gang condenser of reasonably modern de sign and there should be no more troub with it. As for the wind screen motor, w have no idea whether or not it would b applicable for driving a turntable. The prob

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R. & H. Oct.

ANSWERS TO CORRESPONDENTS

is more likely to be a matter of ob- ing adequate power than anything to do ı interference due to sparking.

H. (Banksia, NSW) is interested in the st version of the "Little General" and whether a "Reinartz" coil can be used place of the aerial coil.

Provided the Reinartz coil is of modern gn, it will probably track with a new llator coil of the same brand and type. reaction winding will naturally be left onnected.

.J.S. (Five Dock, NSW) asks whether it necessary to have a permit to purchase army type transmitting equipment.

No, the regulations governing the acquion of this equipment have long since ex- d and you can buy it without restriction. vever, it is important to realise that the nsmitting circuits must not be put into ration unless one has the necessary AOCP cover amateur operation. For informa- n on courses of study, we suggest that you in touch with the Marconi School of eless and the Australian Radio College, h of which advertise in this magazine. The eless Institute also run classes on occa- ns and the PMG Dept. can supply copies the examination syllabus and relevant rature for a small charge.

.T.R. (Ringwood East, Vic.) says he gets ellent results from the Two Valve Set For adphones, except that there is a continuous sing noise behind the signals.

It is possible that the trouble is caused a noisy resistor in the plate or screen circ t of the 1K5-G or the plate load of the -G. Try other resistors in these posins, and also try substituting for the various pass and coupling condensers. A runvn B-battery can also cause noisy operan. Your one valve circuit is quite a ndard arrangement and should give good ults. However, you may find it necessary connect a .00025 mfd. bypass condenser been earth and the side of the RF choke rete from the plate of the valve.

.C. (Coogee, NSW) reports having built our electric clock and soldering pencil, h with successful results. He also has version of the "Springtime Portable" and s the output is distorted at high volume.

Many thanks for your letter and the otographs of the finished articles, which tainly have a very nice appearance. The wer output available from any of these all portable sets is very limited, due to the all valves used, the low B-battery voltage d the comparative inefficiency of midget dspeakers. One can expect only enough tput for the sound to be heard a few feet ay in the open air, or at moderate volume a room. Any attempt to increase the ume beyond this level only results in overding of the audio system and severe distion.

R.M. (North Bondi, NSW) takes us to task using plug-in coils in one or two of our cent short-wave receivers, and suggests at the system is old fashioned.

A. We have no serious quarrel with your marks, R.M. and agree that plug-in coils e old fashioned. But, for all that, they e far easier to get into operation, especially trimmed manually for amateur band work. y number of additional sets of coils can be und up at leisure without rendering the inoperative during the course of one's periments. The idea of all-band operation th switched coils is very convenient and s adopted for the "Communications Nine" ceiver. But you can take it from us that ere is quite a lot of work to wind and just a dozen superhet. coils and to instal em around a switch without running into uble from losses or absorption effects. ere are plenty of readers who will not just ckle the task. As for all-band commercial its, we know of none on the market at the ment. Even manufacturers are not keen producing these units commercially beuse limited demand, high price and assembly fficulties make them a poor proposition ancially and in respect to labor problems.

R.B. (Blakehurst) says he has built "Little n II" and has had great success with it.

A. Many thanks for your report on the , R.B. The 19 draws the same filament rrent as the 1J6-G and should be no avier on batteries. However, it is poor nomy to use a small cell with this filant, which is rated to draw 0.24 amp. at volts. You would be well advised to use accumulator which you apparently have ailable.

. G. McK. (Dennington, Vic.) asks whether EF50 could be used in the RF stage of "Communications Nine" receiver and ether any alterations would be necessary.

A. Yes, and EF50 is quite satisfactory for s service. Provided care is taken with bypassing and layout there should be no rticular difficulty with instability. The een can operate from the full high tension tage, while the bias can be adjusted for best balance between gain and stability.

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SWITCHING B & C BATTERIES

A reader from St Peters, NSW, asks the following question: "Can you inform me through the columns of your magazine whether it is necessary to have an off-on switch on the B and C batteries of a battery set?"

THE answer to this question depends entirely on the circuit arrangement of the receiver. In the majority of cases it is sufficient to switch off the valve filaments, leaving the B and C batteries permanently connected. With the filaments off, the valves cannot pass current and no load is imposed on the high tension supply.

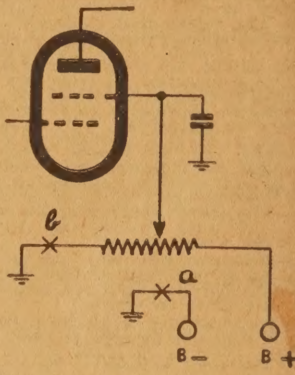
The high tension voltage is naturally present in the circuits and across the various bypass condensers but, if these are in order, the leakage through them will be to all intents and purposes zero. There is therefore little point in providing a switch on the bias or high tension supply.

However, there are circuits in which gain or reaction control is achieved by means of a potentiometer connected across the high tension and used to vary the screen or plate voltage of one or more valves. The value of the potentiometer is usually such that the current through it is very small—probably just a fraction of a milliamp. This is of no consequence while the set is in operation, but it represents an unnecessary and harmful drain on the B batteries during the normal rest period, while the set is not in use.

The remarks, naturally, do not apply where a potentiometer is used purely as a series resistor, with no connection to chassis.

However, if the normal potentiometer circuit is used, it is essential to provide a switch to break the circuit through the B batteries and the potentiometer. Insertion of a switch at either point A or point B in the sketch will have the desired effect. In the normal way, the operation can be performed by an extra pole on the filament switch, using one section for the filaments and the other for the high tension circuit.

It should be emphasised that both circuits cannot be broken with a single pole switch, and the arrangement in figure 2 is both unsatisfactory and dangerous. It is unsatisfactory because it does not open the high tension circuit to chassis, even though B-minus lead is broken. Actually, B-minus still goes to chassis via the A battery and the valve filaments, so that any drain imposed by the potentiometer remains.



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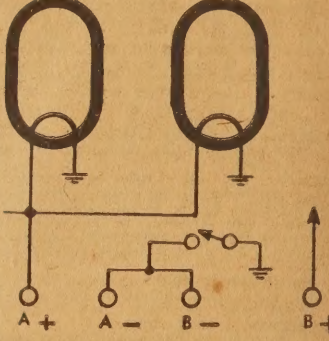

(2)

What is no less important, the A and B batteries are connected in series when the switch is in the open position, being connected to chassis via the filaments. An accidental short between B-plus and chassis, or a breakdown in the high tension bypass condenser connects the total voltage across the filaments, with a very sad and inevitable result. If you want to break the A-minus and B-minus leads, do it with a double pole switch.

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HANDIE-TALKIE'

(Continued from Page 75)

high up as possible on the side of e cabinet and you will find that the gs clear the chassis assembly quite cely. The grid and AVC connections ust be made to the receiver with ort lengths of hook-up, while the rial and earth connections can be rminated in pin jacks on the side of e cabinet.

The signal pickup from a small loop naturally restricted and, once out the immediate vicinity of local stations, it is desirable to supplement the gnal pickup by using an external erial and earth connection. There is o need to worry about this for the rdinary suburban beach picnic, but r more remote operation take along couple of lengths of wire. However, e are getting ahead of ourselves.

The A-battery is best held in a spring lip attached to the rear lid. We bent ne up from a scrap of duralumin, hile the spring brass clip for the positive connection came from a cycle attery. You will find that the A-attery will need changing after a few ours operation, and the idea of soldering wires to it is quite impractical.

ILAMENT BATTERY

We suggest that you follow our lead nd provide for the type of cell used n the ordinary cycle lamp battery. imply break the battery in halves, clip ne cell into place and pop the other ne into your pocket for future use.

Before you switch the set on, double heck the wiring and, if possible, measre the filament voltage on all sockets vith the receiver connected to the atteries and to the loop aerial. Valves re scarce, expensive and easily ruined y overload. Plug the valves in and, f everything is OK, the set should une in a strong station.

We found that the IF transformers sed in the original were a long way ff optimum setting, and quite a lot f adjustment was necessary to bring hem into line. A problem if you have o oscillator, but that's the way it is— r was.

ADJUSTING CORES

We had to manufacture a small tool o grip the core slugs. Get a scrap f 18 gauge wire, bend the tip around harply with the pliers, allowing just nough clearance to slip over the flat portion of the screws. Solder the tip o hold the bend rigid and bend the rest of the wire at right angles to form a handle.

The alignment then follows normal procedure, as described for other superhets. If the receiver tends to be unstable, increase the value of the screen dropping resistor. Conversely, you may be able to reduce it slightly without encountering trouble. But, if you find that you can operate the screen from the full high tension voltage it is almost certain that the IF transformers are not peaked properly or that the connections are the wrong way round.

That, then, is the story of our 1947 "Handie Talkie," the first of our really midget portables.

BOOK REVIEWS

In compiling this book, the author has elected to devote the first three chapters, amounting to almost 100 pages, to a survey of radio theory and circuits. This will be good reading, therefore, for those whose technical ideas and conceptions need setting in order.

"RADIO RECEIVER SERVICE AND MAINTENANCE," by E. J. G. Lewis, M. (Brit.), IRE. Price 12/6 (approx.), plus 6d postage. Hard cover, 324 pages.

Chapters 4 to 6 take up the servicing angle, with a discussion of servicing equipment, testing components for faults, and fault-finding procedure in a receiver. Then follow general chapters on superheterodynes, all-wave receivers, aerial systems and interference, press button tuning, loudspeakers and pickups. The book ends with a discussion of radio gramophone combinations, ac/dc receivers and an appendix giving sundry color codes and data.

The book is written mainly around English equipment but the Australian reader will nevertheless find much useful information between its covers. (Our copy from Angus and Robertson.)

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